THE CONDITIONS OF ECONOMIC PROGRESS

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CHAPTER I

THE SCOPE OF ECONOMIC PROGRESS

ECONOMICS is defined as the study of the production, distribution and exchange of all those goods and services which are usually exchangeable, or are actually exchanged, for money. The definition of economics has been, speaking generally, reduced to something like this scope by Marshall and by Professor Pigou, though wider definitions have been used in the past and are still used by some.

We cannot, however, make proper use of economics until we have determined its position in relation to certain other branches of knowledge.

"They are to be called wise", says Aquinas, "who put things in their right order and control them well. Now, in all things to be controlled and put in order to an end, the measure of control and order must be taken from the end in view; and the proper end of everything is something good. Hence we see in the arts that art A governs and, as it were, lords it over art B, when the proper end of art B belongs to A. Thus the art of medicine lords it over the art of the apothecary, because health, the object of medicine, is the end of all drugs that the apothecary's art compounds."

Economics also must take its place in the hierarchy of arts and sciences. Economics should dominate and co-ordinate the activities of engineering, agricultural science, industrial chemistry, accountancy and all sciences whose main object is the production and exchange of useful goods and services. Economics may also exercise a partial but not a dominating influence over some other sciences such as medicine. The proposals which are made from time to time by engineers and other natural scientists to rewrite economics according to their own principles are a reversal of the order of nature. When analysed down, most of

these schemes are found to be in essence proposals for increased production of certain goods as an end in itself, whether people want them or not, and irrespective of the amount of resources which they take away from other production.

But just in the same way economics must obey its own superiors. In the first place, it must recognise the authority of political science, for without a political order men cannot live together in communities at all. Have we needed the present-day experience of certain parts of the world as well as the lessons of history, to tell us what happens to economic progress once political anarchy supervenes?

"A political theory [describes] the kind of human community its advocate thinks desirable and also possible, having regard to human nature. An economic theory, on the other hand, is what somebody supposes to be the best way in which a community can get and use the material means to living the kind of life which it thinks possible and desirable." [1]

The next rank in the intellectual hierarchy is that of the historian, for it is only by historical methods that we can assemble all the necessary facts for making a true judgment of any economic question, taking into account also the relevant facts of political, cultural and religious history.

But the final judgment on each of these questions will involve, directly or indirectly, decisions in the field of moral philosophy, of what is right and what is wrong according to the true interpretation of man's nature; and it is our duty, not only to avoid evil, but to promote good by making justice and charity the ultimate objectives of all social action.

To refuse to accept this hierarchy of authority, and to claim that the study of economics as an isolated science can safely tell us the course of action to be pursued, is tantamount to repeating, on a much larger and more serious scale, the error of those engineers who think that their own science can settle all necessary problems in

[1] G. R. G. Mure, Warden of Merton, in the *Cambridge Journal*, June 1950.

economics. It is tantamount to the setting up of the production and exchange of goods as an end in itself, without regard for its effects on society. To claim full independent authority for the conclusions of economics is equivalent to an admission of that *materialism* which is explicit in Marxism and so largely implicit in *Liberalism*.

The word *materialism* is used in its colloquial rather than its philosophical sense (though the two meanings are not unrelated), i.e. the concept that the only things which really matter are the things which are "material" in the sense of being purchasable for money.

The word *Liberalism* on the other hand is used to describe that body of doctrine which is generally known by that name in Europe and which used to be called *Utilitarianism* in England. Its essential tenets are (or were) that all economic problems could be solved by free competition, and all political problems by instituting representative government. As a complete system of thought, Liberalism was being generally abandoned by about 1870 in Europe, and a generation later in England, though it has survived in various diluted forms. Liberalism in the true sense of the word is still, however, the philosophy of a large and influential element in the United States, including the more conservative business elements. Of course Liberalism as defined above bears little or no relation to the various political movements which now call themselves "Liberal". In U.S.A. the title "Liberal" is apparently increasingly coming to mean a sympathiser and "fellow-traveller" with that Marxian Communism which is of course the complete antithesis of Liberalism. In England the meaning of the word appears to be gradually evolving in the same direction, and certainly now bears little relation to its nineteenth-century meaning. In Canada the Liberal Party three-quarters of a century ago was at great pains to dissociate itself from the concept of Liberalism defined above, and in both Canada and Australia the word has now come to mean, in effect, the conservation of the present economic and political order.

Liberalism (succeeding Utilitarianism as that title went

out of use) has remained, however, subject to some modifications, the basic concept of most economists in Britain, U.S.A. and France right up to the present time. That is to say, they have accepted (with a gradually increasing number of exceptions) the Liberal theory of economics, and also by general implication rather than by specific reference, the Liberal theory of politics as providing a background against which competitive capitalism can work satisfactorily.

An economist who fully accepts Liberalism will make the characteristic Liberal error of claiming absolute validity for economic conclusions, as most of the nineteenth-century economists did. The later economists, led by Marshall and more clearly by Professor Pigou, did not make this claim — indeed the subordination of economics to ethics is the starting-point of Professor Pigou's whole system. Man's object, he contends, is not wealth as such, but "welfare", a much broader concept. He then sets out to show that an abundance of economic (i.e. saleable) goods and services, provided they are obtained without too great an inequity of distribution or uncertainty of flow, should contribute to human welfare.

Professor Pigou's analysis, which has stood as the foundation of economic theory for the past generation, is not to be denied, but perhaps needs to be supplemented. In the first place, as has been mentioned above, the dependence of economic welfare upon the existence of a just, ordered and stable political system must, in the light of grim experience, be specifically considered rather than tacitly assumed. Further, in our study of what contributes to human happiness, we should, if we can, cast our thoughts a little beyond the rather narrowly conceived "welfare". In trying to design an economic system which will really play its part in enabling men to live happily, should we not take account of that intense desire for security which means a great deal more than the continued provision of a money income sufficient to buy the necessaries of life; which means the possession of sufficient property and the enjoyment of sufficient independence to enable them to do

what work, and in what manner, they really wish: should we not also take into account man's need for a certain degree of tradition, the satisfaction he gets from using things handed down to him by his father, his desire to hand on traditions to his sons? An economic system which leaves no place for tradition, makes no provision for the family as an economic unit, and leaves the great majority unable to own their means of production, denies the true dignity of man.

Coming back to more purely economic issues, we may judge the success of an economic system, as an economic system, by the extent to which it enables men to satisfy (without contravention of morality) their desires.

It follows logically from this that we must ask ourselves: are we doing any good in labouring to provide a greater abundance of goods and services, if in the course of so doing we cause man's desires to increase (whether directly through advertising or indirectly as a result of the general restlessness and competitiveness of the world in which they live) faster than the means of satisfying them; which is apparently what we have done in most modern communities.

These and many other considerations have to be taken into account in assessing the true value of that economic progress, defined narrowly in accordance with the Cambridge tradition, which this book sets out to measure.

However, it has often happened in human history that, in their zeal to deny one error, men fall into another equally serious. In denying, as above, "materialism", or more precisely Utilitarianism (the claim that economic progress is the only thing which really matters, or any exaggeration of its importance), many say that it does not matter or hardly matters at all, an equally serious error. It is an attempt to combat materialism with a false spirituality. That people should be without means of satisfying their material wants, particularly their elementary wants, is a very serious matter; and anything which we can do to enable other people to satisfy their material wants is (if truly inspired by that motive) a genuine act of charity.

To deny oneself material satisfactions, for a good end, may be very meritorious: but there is nothing good about saying that other people are better without them.

"For then only will the economic and social order be soundly established and attain its ends, when it offers to all and each all those goods which the wealth and resources of nature, technique, and the social organisation of economic affairs can give."

The goods and services which come within the scope of economics are popularly described as material requirements, using the word "material" not in the literal sense (for much of the output and consumption with which economics has to deal consists of services[1] rather than goods) but in the sense that people are willing to pay money for them, either as individual consumers, or, in the case of services supplied by public authorities, such as defence and education, have expressed their willingness, through the machinery of government, to pay for them in their collective capacity. The scope of economics, therefore, is the production and distribution of all goods and services which fall within this definition.

The securing of an abundant supply of these goods and services, though among the most important objects of economic science, is by no means the only object. We properly include among the objects of economic science the attaining of a just distribution of wealth between individuals and groups, and security of their livelihoods, the mitigation of economic fluctuations, and the increase

[1] It was an outstanding error on Adam Smith's part to attempt to exclude services from his definition of real national product. This exclusion, together with many other obsolete doctrines, persisted in the Soviet definition of national income until Stalin's recent pronouncement (October 1952) decreed that certain services (in a Soviet economy, but not elsewhere) were to be regarded as part of the national product.

Adam Smith's error was not shared by a historian-philosopher who wrote on economics some four centuries earlier, namely Ibn Khaldun (see *Ibn Khaldun, Pioneer Economist*, by Dr. Nashat, published by Imprimerie nationale, Cairo, 1945). He included in his definition of production medical service, education, music. What he does exclude from his definition of production are activities based on fraud, exploitation or ignorance, mentioning particularly astrology, alchemy, searching for buried treasure, and "various public servants who receive their shares from public receipts vitiated by injustice, oppression and fiscal pressure". Something to think about in the modern world?

of leisure, though recognising that these objects are sometimes inconsistent with each other, and that progress in one direction can only be made by sacrifice, or at any rate considerable diminution of potential progress, in another direction.

Conflict between these objects is by no means inevitable. Many economists are now of the opinion that we can move simultaneously in the direction of a greater production of goods and services, greater equality of distribution and a steadying of economic fluctuations. The desire for greater leisure will of course conflict with the desire to increase output of goods and services; and security for particular individuals and groups is often incompatible with maintaining a full rate of economic progress. On these two issues, and on other conflicts between purposes which may arise, it is not the business of the economist to make a decision. It is the business of the community as a whole in its collective or political capacity. It is the duty of the economist to inform the community, carefully and objectively, of the gains and losses which will follow each decision.

The current production of goods and services in each community, measured in a certain way, is referred to as its *real national income.*

During recent years schemes of social accounting have been devised of ever-increasing complexity and sophistication, but for the definition of real national income, and the justification of the definition, we cannot do better than follow the lines laid down many years ago by Professor Pigou in *Economics of Welfare.*

" Generally speaking, economic causes act upon the economic welfare of any country, not directly, but through the making and using of that objective counterpart of economic welfare which economists call the national dividend or national income. Just as economic welfare is that part of total welfare which can be brought directly or indirectly into relation with a money measure, so the national dividend is that part of the objective income of the community, including, of course, income derived from

abroad, which can be measured in money. The two concepts, economic welfare and the national dividend, are thus co-ordinate, in such wise that any description of the content of one of them implies a corresponding description of the content of the other. The concept of economic welfare is essentially elastic. The same measure of elasticity belongs to the concept of the national dividend. It is only possible to define this concept precisely by introducing an arbitrary line into the continuum presented by nature. It is entirely plain that the national dividend is composed in the last resort of a number of objective services, some of which are embodied in commodities, while others are rendered direct. These things are most conveniently described as goods — whether immediately perishable or durable — and services, it being, of course, understood that a service that has already been counted in the form of the piano or loaf of bread, which it has helped to make, must not be counted again in its own right as a service. It is not, however, entirely plain *which part* of the stream of services, or goods and services, that flows annually into being, can usefully be included under the title of the national dividend. That is the question which has now to be discussed.

"The answer which first suggests itself is that those goods and services should be included (double-counting, of course, being avoided), and only those, that are actually sold for money. This plan, it would seem, must place us in the best possible position for making use of the monetary measuring rod. Unfortunately, however, for the symmetry of this arrangement, some of the services which would be excluded under it are intimately connected, and even interwoven, with some of the included services. The bought and the unbought kinds do not differ from one another in any fundamental respect, and frequently an unbought service is transformed into a bought one, and *vice versa*. This leads to a number of violent paradoxes. Thus, if a man hires a house and furniture belonging to somebody else, the services he obtains from them enter into the national dividend, as we are here provisionally defining it, but if he receives the house and furniture as a gift and

continues to occupy it, they do so no longer. Again, if a farmer sells the produce of his farm and buys the food he needs for his family in the market, a considerable amount of produce enters into the national dividend which would cease to enter into it if, instead of buying things in the market, he held back part of his own meat and vegetables and consumed them on the farm. . . . Yet again, the services rendered by women enter into the dividend when they are rendered in exchange for wages, whether in the factory or in the home, but do not enter into it when they are rendered by mothers and wives gratuitously to their own families. . . . It is a paradox, lastly, that the frequent desecration of natural beauty through the hunt for coal or gold, or through the more blatant forms of commercial advertisement, must, on our definition, leave the national dividend intact.

". . . Objections . . . could be urged in some degree against any definition of the national dividend except one that coincided in range with the whole annual flow of goods and services. But to adopt a definition so wide as that would be tantamount to abandoning dependence upon the measuring rod of money. . . . I therefore include everything that people buy with money income, together with the services that a man obtains from a house owned and inhabitated by himself. But 'the services which a person renders to himself and those which he renders gratuitously to members of his family or friends; the benefits which he derives from using his own personal goods (such as furniture and clothes), or public property such as toll-free bridges, are not reckoned as parts of the national dividend, but are left to be accounted for separately'.

" The above conclusion does not complete the solution of our problem. Given the general class of things which are *relevant* to the national dividend, a further issue has to be faced. For the dividend may be conceived in two sharply contrasted ways: as the flow of goods and services which is *produced* during the year, or as the flow which passes during the year into the hands of ultimate consumers. Marshall's conception of the dividend includes an

inventory of all the new things that are made, and of all the services not embodied in things that are made, and of all the services not embodied in things that are rendered, accompanied, as a negative element, by an inventory of all the decay and demolition that the stock of capital undergoes.

"This definition carries with it certain plain implications as to the way in which that dividend must be evaluated. The first and most obvious of these is that, when the value of a finished product is counted, the value of materials employed in making that product must not be counted also.

"Again, in so far as any sort of crop wastes the productive powers of the soil, the value of the dividend will fall short of the value of the aggregated net product by the cost of returning to the soil those chemical ingredients that it removes. Yet again, when minerals are dug out of the ground, a deduction should be made equal to the excess of the value which the minerals used during the year had in their original situation — theoretically represented by the royalties paid on their working — over the value which whatever is left of them possesses to the country after they have been used. If 'using' means exporting in exchange for imports that are not used as capital, this latter value is zero.

"It remains to consider the relation between the national dividend as thus evaluated — an addition, of course, being made for the value of income received from abroad — and the money income accruing to the community. On the face of things we should expect these two sums to be substantially equal, just as we should expect a man's receipts and his expenditure (including investments) to be equal. With proper account-keeping this clearly ought to be so. In order that it may be so, however, it is necessary for the money income of the community to be so defined as to exclude all income that is obtained by one person as a gift against which no service entering into the inventory of the national dividend is rendered — all allowances, for example, received by children from their

parents. In like manner, if A sells existing property or property rights to B for £1000, the £1000, if already counted as a part of B's income, must not be counted as a part of A's income also. These points are, of course, well understood. But certain further implications are less fully realised. Thus the incomes constituted by old-age pensions and special war pensions must be excluded; though ordinary civil service pensions are properly included, 'because these may be said to be equivalent to salaries, and the pension system is only an alternative to paying a higher salary to those rendering existing services and leaving them to look after their own superannuation allowance'. There must also be excluded all income received by native creditors of the State in interest on loans that have been employed 'unproductively', i.e. in such a way that they do not, as loans to build railways would do, themselves lead to the production of services which are sold for money and thus enter into the national dividend as evaluated in money. This means that the income received as interest on war loan must be excluded. Nor is it possible to overthrow this conclusion by suggesting that the money spent on the war has really been 'productive', because it indirectly prevented invasion and the destruction of material capital that is now producing goods sold for money; for whatever product war expenditure may have been responsible for in this way — and a similar argument applies to expenditure on school buildings — is already counted in the income earned by the material capital. Yet again, it would seem that income obtained by force or fraud, against which no real service has been rendered, ought not to be counted. There are, furthermore, certain difficulties about payments made to Government. The moneys that governing authorities, whether central or local, receive in net profits on services rendered by them, e.g. the profits of the Post Office or of a municipal tramway service, should clearly be counted. What the Treasury receives in income tax or death duties should, on the other hand, clearly not be counted, because this income, which has already been reckoned as such in private hands, is not passed to the

Treasury in payment for any services rendered by it, but is merely transferred to it as an agent for the tax-payers. What the Treasury received in (the now abolished) excess-profit duty and corporation tax, as operated in England, stands, however, on a different footing. It should be counted, because the incomes of companies and individuals were reckoned as what was left *after* these taxes had been paid, so that, if the income represented by them had not been counted when in the hands of the Treasury, it would not have been counted at all. Finally, the main part of what the Treasury receives in customs and excise duties ought, paradoxical as it may seem, to be counted, in spite of the fact that it is already counted when in the hands of the tax-payers and that it is not paid against any service. The reason is that the prices of the taxed articles are pushed up (we may suppose) by nearly the amount of the duties, and that, therefore, unless the aggregate money income of the country is reckoned in such a way that it is pushed up correspondingly, this aggregate money income divided by prices, that is to say, the real income of the country, would necessarily appear to be diminished by the imposition of these duties even though it were in fact the same as before.[1] When the nominal money income of the country has been 'corrected' in these various ways, what is left should approximate fairly closely to the value of the national dividend (inclusive of incomes from abroad) estimated on the plan set out above."

The service obtained from the use of houses is therefore included in the national income, whether the house is rented by an occupier who pays money to the owner, or whether the owner lives in it himself. In the case of all other durable consumption goods, however, such as furniture, motor cars, books, cutlery and so forth, no "imputed income" is included. It may seem a little arbitrary to include houses and omit all these other utilities. It is clear, however, that a line has to be drawn somewhere, and we

[1] The reason why it is only claimed that the main part, not the whole, of what the Treasury receives under this head should be counted as income is

(1) that commodity taxes may not always raise prices by their full amount, and
(2) that they may indirectly cause production to contract.

can at any rate say that the occupation of a house is a service customarily exchangeable for money, whereas that is only comparatively rarely the case with the use of furniture, motor cars, etc.[1]

Marshall's exclusion of the services of public property such as "toll-free bridges" is generally accepted, at any rate so far as the older countries are concerned, where, in enjoying these services, we are making use of capital goods produced in the remote past. In the case of newer countries, where such public property as bridges and roads has been produced with much toil and pain by the outlay of capital in comparatively recent times, on which capital interest and depreciation are still being paid, the situation is different.

Professor Pigou's distinction between real income produced and real income consumed may, and indeed must, be carried further in the case of countries engaging to any substantial degree in international trade. Two quite separate groups of considerations must be taken into account here. The first relates to the "terms of trade". If a country produces and exports substantial quantities of certain products and imports and consumes substantial quantities of certain other products, there are two quite separate methods of measuring the real national income. A figure of the quantity of goods and services produced, measured at standard prices, may give quite a different result from the figure of the quantity of goods and services consumed, also measured at the same standard prices. The amount of imports which the country obtains in return for a given volume of exports may vary very greatly from year to year, and thus the real income available for consumption may vary widely while the real income produced remains constant.

Quite a different consideration, though often interwoven with the problem of terms of trade, is the existence

[1] Nevertheless in *The National Income of Sweden*, prepared by Professor Lindahl and others, an interesting series of calculations, by Mr. Holmstedt, of the imputed income obtained from the stock of all durable goods of this nature has been included. The order of magnitude of the imputed income thus obtained is small in comparison with that obtained from houses. Similar calculations for U.S.A. have also been made by Dr. King and the Brookings Institution.

of international indebtedness. If the Government of a country, or public institutions or private companies within the country, are under an obligation to pay abroad certain sums as interest, this transaction will in general take the form of the export of certain goods and services without any corresponding imports being obtained. The same applies to dividends, profits and other property incomes claimed by foreign capital out of the country's annual produce. In the same way, in "creditor countries" there is an addition to money and to real national income in the shape of income earned abroad and belonging to the Government or citizens of the creditor country. In the case of countries where such receipts are substantial, a distinction is often made between "total" and "home-produced" income. In the case of debtor countries the phrases "produced" and "available" income are used.

It is clear that the amount of real income paid by debtor countries and received by creditor countries will vary greatly with changes in the terms of trade, and a number of complex statistical problems arise in this connection. Difficult problems also arise in the case of certain inter-governmental transactions. In the case of various inter-governmental debt transactions during this period, some difficult points of definition arise as to which transactions should be included in the national income.

In the working of exhaustible natural resources such as minerals and oil, some rough-and-ready allowance is sometimes, but by no means always, made. American income statistics contain a full allowance for amortisation of such assets. British income-tax regulations, however, allow no deduction for wasting natural assets. In the same way, the value of production of timber throughout the world is generally reckoned before charging the amortisation of the natural assets involved, but on the other hand, the natural growth of forests is not generally reckoned in income. For certain countries, however, the quoted figures of national income require to be reduced for the effects of wasting of natural assets in minerals and timber.

This applies more strongly in the case of agriculture. No calculations have ever been made in any country as to the extent of exhaustion of natural fertility of soils and pastures. It is clear, however, that the methods of cultivation and pasturing of western and northern Europe, which have been carried on continuously for thousands of years, conserve the natural fertility of soils and pastures; while it is equally clear that the methods of cultivation and pasturing carried on in many other parts of the world certainly do not. A recent estimate by the United States Department of Agriculture showed that the annual restoration of nitrogen to the soil in that country by the use of fertilisers only made up one-ninth of the amount annually abstracted by cultivation and pasture. In many parts of the United States, Canada and Australia soils and pastures have been indisputably destroyed by erosion. Even in some of the older settled agricultural countries such as North Africa, Spain and the hilly regions of India and China there are considerable grounds for believing that the methods of cultivation of the last few centuries have resulted in erosion and in serious progressive destruction of fertility.

Though it is, unfortunately, as yet impossible to give even the most approximate numerical valuation of the extent of this destruction of natural resources in different parts of the world, the reader must carry in his mind throughout very serious qualifications when examining all agricultural and pastoral statistics. In the case of mineral and timber production the extent of exhaustion of natural resources is probably trifling compared with that which arises in agriculture.

Purposive scientific generalisation differs from the meaningless accumulation of facts only in that the former uses the method of *comparison*. Comparisons of economic welfare between one community and another, one economic group and another, and between one time and another, are the very framework of economic science. Anything which can be done to promote the scope and improve the technique of such comparisons is of fundamental importance.

Certain modern theoretical economists have gone so far as to say that it is impossible to compare the level of income between two communities or between two individuals, or even between the same individual at different times; in other words, they deny the existence of any objectively measurable economic welfare (and incidentally provide themselves with a magnificent excuse for avoiding any study whatever of realistic and quantitative economics). Exponents of this view do not realise what an intellectual anarchy they will let loose if their theories are adopted. Deprive economics of the concept of welfare and what have you left? Nothing: except possibly the theory of the trade cycle, where all values may be capable of expression in money terms without the introduction of the concept of welfare. In this case too you might be left in great doubts as to whether even the trade-cycle problem is worth solving.

There is a good deal of rather ignorant sophistication on this subject nowadays, but most of those who indulge in these views have in fact never read the relevant passages in *Economics of Welfare*. In a brilliant piece of logical reasoning it is there clearly shown that economic welfare can be compared between times and places, and that the best comparison, under conditions prevailing in the actual world, can be made by use of a so-called "Fisher" index number (though by right of simultaneous discovery, it might well be called a "Pigou–Fisher" index).

To compare for instance the real value of \$0·819 produced per hour worked in U.S.A. in 1929, and 1·34 Rm., or \$0·320 at par of exchange, produced per hour worked in Germany in the same year, we must take account of the actual quantities of goods and services produced, or, in other words, what the money will buy. The average American over that period spent his income in a certain way, purchasing certain quantities of goods and services. If he had gone to Germany and had set out to purchase exactly the same goods and services, he would have found that they were 0·9 per cent cheaper in the aggregate than in his own country. The German with his income pur-

chased certain goods and services, by no means in the same proportion as the American. He spent relatively less of his income on motor cars and rent, and relatively more on food. The German going to America and purchasing the goods and services which he was accustomed to consume would find that they were 19·8 per cent dearer. In comparing the real value of incomes in the two countries we must therefore allow something between 19·8 and 0·9 per cent for the difference in purchasing power of money. The ideal formula gives us the result that the comparative real income per head can be obtained from the geometrical mean of these two ratios, or

$$\frac{\text{Average real income in America}}{\text{Average real income in Germany}}$$

$$= \frac{\text{Average money income in America}}{\text{Average money income in Germany}} \sqrt{\frac{\text{Cost of American goods at German prices}}{\text{Cost of German goods at American prices}}}$$

$$= \frac{0{\cdot}819}{0{\cdot}320} \times \sqrt{\frac{\cdot 991}{1{\cdot}198}}$$

The ratio is seen to be 2·33 as against the 2·56 which we obtained from a crude comparison of money incomes.

By the application of this and other index numbers we can make comparisons of economic welfare of different times, places and groups of people without in any case having to use any more elaborate formulae than the one given above. In some cases even simpler comparisons will, in the present state of knowledge, be all that are worth attempting.

CHAPTER II

REAL NATIONAL PRODUCTS IN 1950

For international and inter-temporal comparisons of real national income, a standard known as the "International Unit" (written I.U.) was used in previous editions of this book, and will continue to be used for the economically advanced countries, but not — for a reason to be given below — for the under-developed countries.

This unit was designed in 1937, and first used in an article on this subject published in *Weltwirtschaftliches Archiv* in January 1938. One I.U. of real income was taken as the quantity of goods exchangeable in the U.S.A. for $1 over the average of the decade 1925–34. To us now this seems rather an odd decade to take as a standard of comparison. It was perhaps defensible at the time, as including 5 years each of the very different trading conditions of the 1920s and of the 1930s. In due course it will have to be replaced; but it does not appear that we have yet an alternative base which will give us the possibility of an improvement big enough to justify the not inconsiderable labour of converting all previous data to a new base.

The whole theory of the comparison of real incomes by means of an ideal index number involves the assumptions that the levels of real income compared, or the commodities on which they are spent, do not differ in too extreme a manner. Conversion of national incomes to I.U. by means of ideal index numbers therefore is a system which works reasonably satisfactorily in comparing economically advanced countries, and as we go down to lower real incomes, either examining the poor communities of the present day, or going backward in time, we find that the I.U. becomes less satisfactory as a unit. This is because the whole scale of relative values alters.

Consider the relative values of different commodities and

services in modern America, or the wealthier countries of Western Europe, compared with an Oriental country. Grains, which in the former case are comparatively low-valued commodities to be fed to livestock, in the latter case are much sought-after articles of human food. Rice, however, a staple food throughout the Orient, is, because of transport charges or high local production costs, a comparatively expensive grain in the West. Fruits and vegetables, which in the Western world are transported over long distances, and for which the buyer is willing to pay comparatively high prices, are purchased by the Oriental (if he does not grow them himself) in his local market at extremely low prices. Milk is a commodity of which the Western world produces far more than it can drink, and the surplus has to be converted into butter and cheese, with many of the valuable nutrients in the milk being fed to livestock. In most (not all) Oriental countries, the small output of milk obtained is greatly prized, and all consumed whole as human food. The West is willing to pay a great deal for elaborate distributive services, whose cost is enormously enhanced when the goods concerned are perishable.

In the Orient these services cost little, if they are needed at all ; most families obtain their requirements from their own production or from simple exchange from their neighbours. And the last and most striking difference is that domestic and similar personal services, increasingly high priced and hard to obtain in the Western world, are (for obvious reasons) the one commodity which is cheap and abundant in the Orient.

THE "ORIENTAL UNIT" FOR THE MEASUREMENT OF REAL INCOMES

Theoretical reflection, increasingly pointed in this direction, made a fortunate conjuncture with statistical practicability when India published *The First Report of the Official National Income Committee*, relating to the year 1948–49. Let us give all due credit to the earlier workers in the field of Indian National Income, beginning with the

pioneering study of Dr. Dadabhai Naoroji (in the 1870s), to the versatility of Lord Curzon (probably the only Viceroy ever responsible for a national incomeesti mate), and to the new and much higher standards of accuracy and comprehensiveness introduced by Professor Rao in 1935. The National Income Committee, with its financial resources and official backing, has, however, in this Report been able to prepare a much more comprehensive study, and give a more intimate picture of the Indian economy, than we have obtained before.

This makes possible a statistical device for use, not only in India, but in all countries of low real income, namely to define a new unit of real (not money) product, to be called the Oriental Unit or O.U. This is defined as the quantity of goods or services exchangeable directly or indirectly for one rupee in India in 1948–49.

This new unit will be used throughout this study, subject to the following further qualifications :

(*a*) Instead of trying to convert to a "per man-hour" basis, as we have done with I.U. in the wealthier countries, all O.U. values will be expressed instead *per head of the total population, per year.* This is necessary for the good reason that for most low-income countries we lack any satisfactory information, either on the number of hours worked per year, or on the ratio of occupied to total population.

(*b*) As has already been pointed out, most foodstuffs incur little or no distributive cost in Oriental countries.

It is convenient, therefore, further to define real income in such a way that all food production is valued at price on farm and any distributive costs which may be incurred in feeding the urban population are ignored, for the purposes of the present study. In the initial stages of urbanisation, the most convenient device of social accounting is to treat the transport and distribution of food for the urban population as a new charge, not hitherto incurred, which must be debited against the net product of urban industry. The alternative

device, used in wealthier countries, of crediting the whole farm population with an imputed income for the distributive costs which they avoid by living on farms, would be extremely clumsy in application in an Oriental country.

We do, however, take into account in such countries the distributive costs of non-food products.

(*c*) There remains the vexed question of the treatment of Government expenditure. The position at one end of the scale was taken by Professor Hicks. He held that any object upon which the Government decides to spend money (apart from pure transfer payments to old-age pensioners and such) represents *ipso facto* a contribution to real national income. In Germany in 1928 a careful attempt was made to distinguish those forms of Governmental expenditure which represented a true contribution to real national income—" *Bildungs- und Wohlfahrtswesen* " (presumably mainly educational and health services) and " *Kapitalbildung* " or creation of capital assets by public authorities — from other services which did not represent a net contribution to national income, but were in fact a necessary condition without which other production could not have been carried on. Mr. Reddaway, in a recent British study, has called these services " regrettable necessities ". In Swedish national income studies approximate division of Governmental expenditure on these lines has also been attempted. In the United States, Professor Kuznets has adopted the radical position that nearly all Governmental expenditure (with which he would include also certain classes of professional and service incomes at present included in national income totals) is in the " regrettable necessity " category and should hardly be regarded as a net contribution to national capital at all.[1]

In most Oriental and low-income countries, the

[1] The United States Official National Income statistics continue to use the Hicksian definition, including all categories of Governmental expenditure; one reason for this, it has been said, is that there might be Congressional repercussions if any revisions in the methods of compiling figures of national income were to bring about an apparent reduction in the total.

provision of education, health and similar services by Governments is at a minimum. Most Government expenditure is, at best, necessary expenditure for the preservation of law and order ; at worst, the provision of jobs for the relatives of ministers and Parliamentarians, a system of distributing real national product rather than adding to it.

For our present purposes therefore all Governmental expenditure is omitted from real income totals — i.e. such activities are regarded as an unavoidable or avoidable, as the case may be, cost incurred in making other production possible, not as a real product themselves.

It is clear that this is a greatly superior method of expressing the real income of a low-income country. But even this method can only be applied where we have fairly accurate information about agricultural production — the major portion of real income in such countries — some reasonably good information about industrial production, and also some information about numbers engaged in service industries, though these latter are of minor importance on the Oriental Unit scale. The number of low-income countries whose real incomes can be expressed in O.U. is still limited.

The O.U. provides a satisfactory scale of measurement for a very much larger number of low-income countries whose real income can be measured by a still simpler method which will be described, in honour of its discoverer, as the " Bennett method ". Dr. M. K. Bennett, of Stanford University, made his first use of this method in a publication in 1937, and a much fuller developed application of it (but still referring to the 1930s) in *American Economic Review* of 1951. His method is a particularly ingenious way of making use of those small scraps of statistical information which are the only indication we have of the level of economic development in such countries, such as numbers of vehicles, postal traffic, fuel consumption, school pupils, etc. Each of these data is expressed per head of total population,

and a series of index numbers prepared in which the country with the highest figure is taken as 100. Unweighted averages are then compiled from these index numbers. Fresh information now available in the *United Nations Statistical Yearbook* makes possible a new calculation, covering nearly all the under-developed countries, and referring to the year 1950. But Dr. Bennett's formula is amended in several respects. His data on food consumption are omitted because of increasing doubts about the reliability of the data thereon. His data on consumption of fuel and energy are replaced by a considerably improved series of fuel and energy consumption, expressed in coal equivalents, which United Nations now publishes; but a single figure is taken for each country, instead of distinguishing between industrial and other uses, as Dr. Bennett did. Livestock numbers, which are probably more accurate than supposed figures of crop production, are included. A new series recently published by F.A.O. showing for almost every country in the world consumption per head of textile fibres during recent years (after making allowance for the weight of textile fibres in imports and exports of made-up goods) is used. Instead of treating the highest country as the base of each series, India is used as the base throughout; and instead of an unweighted arithmetic mean, a partially weighted geometric mean is used. Including weighted series, we have 25 altogether. To shorten the arithmetical labour, the data of number of vehicles, tons of coal equivalent consumed, etc., are not converted to per head figures, but the original figures are taken in each case and converted into index numbers on the basis of India = 1000. From the sum of these logarithms deduct 25 times the logarithm of the country's population in millions, add 25 times the logarithm of India's population in millions, and then deduct 75 (because each datum was expressed as an index number on the basis India = 1000). The final result is thus a logarithmic index. This short-cut method is described for the benefit of those who wish to repeat the investigation.

The 25 series included were as follows: fibre consumption (weight 5), coal equivalent of fuel and energy

consumption (weight 3), number of cattle and draught animals (weight 3), number of sheep and pigs (weight 2), number of passenger cars, number of goods vehicles, number of passenger-kilometres travelled on the railways, number of letters posted, number of telegrams, number of telephones, number of doctors, number of hospital beds, newspaper circulation, number of radios, number of primary school pupils, number of secondary school pupils.

In many countries one or more of these data was missing. In such cases a preliminary total was obtained without the missing datum or data, and estimates were inserted after studying the figures of other countries which appeared to give about the same figure for such sub-totals.

Having thus discussed the methods which will have to be used for low-income countries, we can now return to the more precise comparisons of the purchasing power of money in different places, which are possible for economically advanced areas. The calibration of O.U. against I.U., and of the Bennett index against O.U., will be discussed after we have obtained our data.

A comprehensive inquiry covering a wide range of goods and services was undertaken by the International Labour Office at the suggestion and with the support of the Ford Motor Company, in respect of January 1931. The object was to ascertain, in fourteen European cities, the precise expenditure necessary to provide the nearest equivalent to the goods and services consumed by an average wage-earning family in Detroit.[1] This is referred to below as "Detroit Inquiry".

In 1930 the Unilever Company undertook a similar investigation, with the object of determining for its own purposes the salaries required in different countries to give a standard of living equivalent to the expenditure of various incomes between £500 and £3000 in England. This inquiry covers the more expensive types of goods and services and

[1] Results published by International Labour Office, *Studies and Reports*, Series N, No. 17, Geneva, 1933, or in an article by L. Magnusson, *Journal of the American Statistical Association*, 1933, p. 123.

thus provides a valuable supplement to other information.[1] This is referred to below as " Unilever Inquiry ".

A very valuable privately circulated memorandum by Messrs. Schwedersky and Deutschbein, Consulting Economists, New York, gives comparative prices in a number of countries in 1935 for motor cars and petrol, telephones, radio and tobacco. It has to be assumed that the price ratios for these goods and services prevailing between the different countries in 1935 were also applicable to 1929.

For a number of reasons it was decided to make 1929 a basic year for international comparison of the purchasing power of money. Forwards and backwards from that date the figures can be adjusted by each country's own index numbers. The best data are available at or around that year, and it comes at the end of a series of years of comparatively undisturbed economic development and international commerce, giving prices the best chance to become adjusted to something like an equilibrium position.

It has to be assumed that the purchasing power of money over consumption goods in any one country gives some indication of its purchasing power over investment goods and Government services.

SOURCES OF DATA ON PRICES

Food.—A comprehensive international comparison of food prices was given by Professor J. H. Richardson in the *Journal of the Royal Statistical Society*, 1930, page 406, relating to the month of January 1930. The Detroit Inquiry gave food prices for January 1931. These can both be reduced to 1929 prices by means of national index numbers and both are used for countries for which both are available. The Unilever Inquiry also gives food prices for a number of countries. The data are not precisely specified but it is assumed that the relative food prices in different countries shown by this Inquiry can be regarded as

[1] Published as *International Middle Class Living Costs* in *The Economist*, vol. 3, 1930, p. 846.

applicable to 1929 without adjustment. These results appear to be less precise than the other two inquiries and when combined with them are only given one-half the weight of Professor Richardson's or the Detroit figures.

An international comparison of food costs prepared in this way can be checked as a result of some data published in *The Impact of the War on Civilian Consumption* (H.M. Stationery Office, 1945). This Report places real food consumption per head in Britain in 1938 at about 10 per cent below that of U.S.A. in 1939. Money values of consumption per head were £25·5 and $109. Including home-grown food consumed on farms at its full retail price, these become £25·9 and $122 respectively and, converting to 1929 prices by use of the official retail price index numbers in each country, £28·4 and $170 respectively. If the real value of the former is 10 per cent below that of the latter, it follows that British food prices in 1929 were 9·5 per cent below those of U.S., whereas the previous comparison based on I.L.O. data made British prices 20 per cent lower.

Similar calculations for Canada show a 1939 money value of consumption of $89·4 per head or $103·5 imputing retail prices to farm consumption, or $138 at 1929 prices. *The Impact of the War on Civilian Consumption* gave Canadian food consumption per head as 10 per cent lower, in real values, than U.S. 1939 consumption. This makes 1929 Canadian food prices 10 per cent below U.S., whereas the I.L.O. comparison makes them 13½ per cent lower.

An approximate calculation for Australia gives a larger discrepancy in the same direction.

It must be concluded, therefore, that while the I.L.O. data serve fairly well to compare other countries with each other, they overstate food prices in U.S.A. by about 10 per cent, and in the calculations which follow prices in the U.S.A. are therefore taken at 10 per cent below the I.L.O. figures.

This discrepancy may be due to:

(i) the cities in which the I.L.O. collection took place having much higher prices than the U.S. average;

(ii) the exclusion of fruit, where U.S. prices are very low;
(iii) differences in weighting between other countries and the U.S., which has a high consumption of fresh milk and a comparatively low consumption of bread, meat and butter.

Rents.— 1936–37 comparison is published in *International Labour Review*, December 1938. Rents generally tend to be higher in capital and larger cities and for this reason the comparison was confined to cities of 100,000 to 500,000 population. Data for Australia (i.e. Brisbane and Adelaide) were added to those published.

The comparison was confined to houses or tenements of 3-5 rooms with bathroom, closet and running water, except that in Italy, Finland, Poland and Yugoslavia, only rents for dwellings without bathrooms were available. The figures for these countries were therefore raised by 5·2 Swiss francs per room per month (the average difference between bathroom and non-bathroom tenements shown by the figures for Austria, England, Hungary, Netherlands, Sweden and Switzerland). Results were given in Swiss francs per room per month, and were converted back into national currency and then converted to the 1929 level by means of each country's index numbers. The basis of comparisons is the U.S.A., but only one American city was included, namely Denver, where average rent per room per month, calculated in this fashion, stood at \$8·07. In March 1938 the Department of Labour Rent Index for Denver stood 4·6 per cent below the average of the sixteen cities between 100,000 and 500,000 population in U.S.A., for which data were available. The base figure is therefore raised to \$8·47.

Germany and Norway were not covered by this Inquiry, and the results of the previous 1932 Inquiry were used (converted to 1929 equivalent): similarly, 1934 results had to be used for Italy.

Clothing.— The Detroit and Unilever Inquiries were used, being given equal weights.

Fuel.— Professor Richardson's table above gives

comparisons of fuel prices for January 1930 assumed to be applicable to 1929.

Car and Petrol.— Messrs. Schwedersky and Deutschbein's figures used, taking for each country one-fifth of the price of a new 14 h.p. car, taxes for one year, and the price of 200 gallons of petrol.

Other Goods and Services.— The sum of "Miscellaneous" and "Medical" in the Detroit Inquiry averaged with the "miscellaneous" category in the Unilever Inquiry (the latter in its published form containing an allowance for rents, which has been approximately removed). With the mean of these two results are combined Messrs. Schwedersky and Deutschbein's data for the annual rental of a telephone with 900 calls, one-half the price of a new radio, plus the annual tax, and 12,000 cigarettes: and I.L.O. data for the price of two litres of beer plus one litre of wine in 1938, for countries for which information was available. Weights allowed were:

Detroit Inquiry	$\frac{1}{2}$
Schwedersky and Deutschbein's data	$\frac{1}{3}$
Prices of drink	$\frac{1}{6}$

OTHER SOURCES

Certain retail prices in South Africa in 1912 were compared with current British prices by J. M. Rees, *Economic Journal*, 1913, page 136, distinguishing (i) food, (ii) rents and (iii) all other expenditure. These data are brought up to 1929 by means of index numbers (allowing also for the fact that the original data referred to Johannesburg only, where prices were above the South African average). Similar data are given in the official Canadian *Report on Prices* of 1915. Comparisons between Australia and Great Britain for 1928 are given by C. H. Wickens, *Economic Record*, 1930, and by Skene Smith in his *Structure and Working of the Australian Tariff* (London, 1929).

A comparison of prices between Greece and France in 1935 is given by Nicolaides in *Grèce : l'effort des dix ans* (Comité Hellénique de Chambre de Commerce internatio-

nale), Paris, 1935. He finds that $3\frac{1}{2}$ drachmae had the purchasing power of 1 franc in 1935, i.e. 3·28 drachmae had the purchasing power of 1 franc in 1929.

New Zealand prices for clothing and " other " are not given in the sources above, and are obtained from the official *Statistics of New Zealand* for 1929, New Zealand prices being compared with Australian.

For certain other countries for which detailed statistics of retail prices have recently become available, direct comparisons were made with Australia for May 1946. This date was chosen because (see below) comparisons between Australia and U.S.A. were also available for the same date. This comparison gives the New Zealand £ a purchasing power of 2·97 I.U. in May 1949. Carried back to 1929 by means of the New Zealand index number, this indicates a purchasing power of 4·53 I.U. at that date (as compared with 4·65 I.U. calculated in Table II).

Detailed figures for Czechoslovakia in 1938 recently published in the official statistical bulletin lead to the conclusion, when the result is carried back to 1929 by the Czechoslovakian retail price index number, that the purchasing power of the Czech crown in 1929 was only 0·0405 I.U., or much less than indicated in Table II.

A recent Turkish national income study published detailed price figures for 1938, which indicated that the Turkish £ had a purchasing power of 1·02 I.U. in that year. The figures of 0·616 for 1929 given in Table II, adjusted by the 30 per cent fall in the index number of retail prices in Istanbul between 1929 and 1938, still only give the Turkish £ a purchasing power of 0·88 I.U. in 1938.

Dr. Gruenbaum in his *National Income of Palestine* gives some detailed figures of retail prices from which it is deduced that the purchasing power of the Palestinian £ in 1939 was 6·30 I.U. This refers, however, only to the purchasing power among the Jewish population ; among the Arab population the figure was 4·76 I.U.

For Dominican Republic, Ecuador, Cuba, Guatemala and Colombia, price data are obtained from various issues (1945 and 1946) of U.S. Department of Commerce

International Reference Service. For Colombia the figures are not available in sufficient detail. The available information is summarised in Table I.

TABLE I

COMPARISONS OF PURCHASING POWER OF MONEY: COLOMBIA — U.S. 1943

Article or Service	Price in Pesos	Estimated Purchasing Power of Peso in I.U.
Hotel accommodation, inclusive per day	5–12	0·35
Unfurnished flat rental, per room per month	19	0·47
House rental, 6–8 rooms, per month	150	0·24
Hand-tailored clothing	Same as U.S.	0·53
Men's furnishings	50–75% more than in U.S.	0·33
Dental fees	Less than in U.S.	0·60
Cinema admission	0·75	0·33
Restaurant dinner	3	0·33
OVER-ALL	..	0·40

Some data, not sufficient to construct an index, are available for Argentine from Swope, *Atlantic Monthly*, June 1940, and from *Revista de la Economia Argentina*, 1940. They indicate that while 1·4 pesos have the purchasing power of $1 over food, 6·1 pesos are needed to give the purchasing power of $1 over motor cars, 5·5 over clothing, 4·2 over electricity and 4·1 over cigarettes. Argentine rents appear to be very low. The general indication is that the peso in 1940 had a purchasing power of about 0·37 1940 dollar, or about 0·45 I.U. Carried forward to 1948 by means of the Argentine price index number this gives the peso a purchasing power of 0·233 I.U. The figure actually adopted for that date on more recent evidence (Table XI) was 0·212.

For the U.S.A. and the following eleven countries in the table, the necessary data for the construction of the table were complete. For the next two countries — Switzerland

TABLE II

International Comparisons of the Purchasing Power of Money, 1929

	National Distribution of Expenditure							National Distribution of Expenditure Revalued at American Prices							American Distribution of Expenditure Revalued at National Prices							Geometric Mean Price Level (U.S.A.=1)	Value in I.U. of One Unit of National Currency in 1929
	Food	Rent	Clothing	Fuel	Car and Petrol	Other	Total	Food	Rent	Clothing	Fuel	Car and Petrol	Other	Total	Food	Rent	Clothing	Fuel	Car and Petrol	Other	Total		
U.S.A.	·255	·144	·134	·035	·077	·355	1·0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1·0	0·924
Australia	·324	·099	·105	·025	·044	·403	1·0	350	·176	·096	·024	·017	·268	0·931	·236	·081	·146	·036	·198	·532	1·229	1·149	3·92
Britain	·310	·090	·115	·040	·028	·417	1·0	·347	·241	·169	·051	·015	·417	1·240	·288	·054	·091	·028	·148	·355	0·904	0·854	5·27
Canada	·300	·200	·180	·060	·065	·195	1·0	·312	·293	·242	·058	·050	·210	1·165	·246	·098	·100	·036	·100	·329	0·919	0·888	1·041
Eire	·435	·080	·120	·050	·012	·303	1·0	·460	·339	·122	·051	·006	·296	1·274	·241	·034	·131	·034	·154	·364	0·958	0·867	5·19
Germany	·400	·110	·150	·050	·010	·280	1·0	·425	·183	·202	·059	·003	·326	1·198	·240	087	·100	·030	·229	·305	0·991	0·910	0·242
Sweden	·310	·100	·150	·100	·020	·320	1·0	·329	·121	·144	·111	·012	·314	1·031	·240	·118	·139	·031	·134	362	1·024	0·997	0·248
Netherlands	·310	·090	·115	·040	·028	·417	1·0	·368	·353	·179	·042	·014	517	1·473	·214	·037	·086	·033	·150	·287	0·807	0·740	0·501
France	·400	·050	·150	·050	·020	·330	1·0	·510	·299	·178	·058	·007	498	1·550	·200	·024	·113	030	·224	·235	0·826	0·730	0·0495
Belgium	·400	·050	·150	·050	·010	·340	1·0	·505	·262	·193	·059	·006	·552	1·577	·202	027	·104	·029	·131	·219	0·712	0·672	0·0382
Denmark	·310	·100	·150	·100	·020	·320	1·0	·331	·281	·172	·122	·011	·332	1·249	·239	·051	·117	·029	·135	·343	0·914	0·855	0·29
Norway	·310	·100	·150	·100	·020	·320	1·0	·293	·149	·181	·119	·009	·243	0·994	·271	·096	·111	·029	·176	·468	1·151	1·076	0·23
Switzerland	·310	·090	·115	·040	·028	·417	1·0	·369	·143	(·111)	030	·008	·367	1·028	·214	·091	(·139)	·047	·227	·405	1·123	1·045	0·171
Italy	·510	·125	·130	·030	·010	·195	1·0	·599	·325	(·139)	·015	003	·164	1·245	·217	·056	(·125)	·070	·229	·422	1·119	·948	0·0514
New Zealand	·300	·150	·120	·035	·395		1·0	·379	·289	·104	·032	·293		1·097	·201	075	·154	·038	..	..	..	(0·968)	4·65
Finland	·500	·125	·120	·075	·180		1·0	·662	·123	·135	·123	·280		1·323	·192	·147	·119	·027	..	..	..	(0·813)	0·0286
Poland	·510	·125	·130	·050	·185		1·0	·757	·426	·168	·061	·269		1·681	·172	·042	·104	·029	..	..	..	(0·640)	0·162
Spain	·450	·135	·140	·030	·245		1·0	·803	·752	·215	·024	·454		2·248	·143	·026	·087	·043	..	..	..	(0·478)	0·285
South Africa	·530	·120	·110	·055	·185		1·0	·677	·120	..	·069	·193 *		1·059	·200	·144	·126	·028	..	..	..	(1·015)	4·43
Turkey	·565	·115	·100	·060	·160		1·0	·689	·363	·088	·102	·239		1·481	209	·046	·152	·021	..	..	..	(0·726)	0·616
Czechoslovakia	·475	·130	·135	·045	·215		1·0	894	·532	·337	·077	·527		2·367	·136	·035	·050	·020	..	..	..	(0·454)	0·0602
Hungary	·510	·125	·130	·050	·185		1·0	·549	·247	..	045	..	..	..	·237	·073	..	·039	..	..	..	(0·957)	0·169
Austria	·465	·065	·140	·040	·290		1·0	·596	·233	..	·040	..	..	..	·199	·040	..	·035	..	..	..	(0·782)	0·166
Estonia	·510	·125	·130	·050	·185		1·0	·734	·625	..	·078	..	..	..	·178	·029	..	·022	..	..	..	(0·630)	0·393
Jugoslavia	·515	·125	·125	·050	·185		1·0	·788	·121	..	·062	..	..	..	·167	·149	..	·028	..	..	..	(0·906)	0·018
Greece	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·860	0·0151

	Assumed Distribution of Expenditure							Value in I.U. of One Unit of National Currency						
	Food	Rent	Clothing	Fuel	Car and Petrol	Other	Total	Food	Rent	Clothing	Fuel	Car and Petrol	Other	Total
Dominican Republic (1945)	·575	·115	·095	·060	·155		1·0	·346	·036	·084	..	·108	..	·584
Ecuador (1945)	·525	·120	·120	..	·235	..	1·0	·0420	·0053	·0120	..	·0177	..	·0770
Cuba (1945)	·545	·120	·110	..	·225	..	1·0	·349	·060	·059	..	·158	..	·626
Guatemala (1945)	·525	·120	·120	..	·235	..	1·0	·656	·043	·096	..	·151	..	·946

* Including clothing.

and Italy — the data were complete except for clothing prices, which had to be interpolated on the basis of the relations between clothing and other prices found in similar countries.

For the other countries in the table no data on car and petrol prices are available. In all these countries the weights due to cars and petrol, according to these countries' own distribution of expenditure, are very small, and therefore the lack of price data will not seriously affect the aggregate. On the other hand, cars and petrol have a weight of 0·077 in the American distribution of expenditure, and to apply assumed prices to this weight would cause considerable error in computing " American distribution of expenditure revalued at national prices ". This latter total, therefore, is not calculated for these countries. The reciprocal of " National distribution of expenditure revalued at American prices ", multiplied by 1·075, is found from the experience of the countries so far covered to give a good approximation to the true geometric mean price level, and this formula is accordingly used for all other countries.

This procedure was applied to New Zealand, Finland, Poland, Spain, Turkey, Czechoslovakia and South Africa (combining " clothing " and " other " expenditure in South Africa's case) and to the five Latin-American countries. For the remaining countries a further simplification is necessary as we have data for food, rent and fuel only. If we combine these on both national and American weights, we can obtain a geometric mean which we call x_1. In the case of the countries so far calculated the final result x_2 is approximately given by $1{\cdot}107x_1 + 0{\cdot}074$. The level of real income per head in different countries, apart from its association with x_1, does not appear to influence the correlation.

This formula is therefore applied to Hungary, Austria, Estonia and Yugoslavia.

Prices in Greece were obtained from a direct link with France (see above).

Data making possible an approximate valuation of the Palestinian £ in I.U. distinguishing Arab and Jewish

TABLE III

Re-calculation of Purchasing Power of the £ in I.U., 1938

Item	1938 British Consumption per Head of British Population Revalued			1939 U.S. Consumption per Head of U.S. Population Revalued		
	Actual Consumption, 1938 £	Actual Consumption Revalued at 1929 Prices £	* Equivalent of 1938 Consumption Expressed in $ of 1939 Purchasing Power	Actual Consumption, 1939 $	Actual Consumption Revalued at 1929 Prices $	* Equivalent of 1939 Consumption Expressed in £ of 1938 Purchasing Power
Food	25·5	28·0 [a]	110	109	..	..
Food, including all farm consumption at retail prices	..	..	..	122	170 [f]	28·4
Alcoholic beverages	5·7	5·6 [c]	21	26	30 [g]	7·1
Tobacco	3·7	2·8 [c]	11	14	14 [h]	4·6
Clothing (not footwear)	7·9	9·8 [b]	44	44	67 [f] (Clothing and Footwear together)	7·9
Footwear	1·5	1·6 [b]	9	9		1·5
Housing	10·4	9·9 [a]	70	70	85 [f]	10·4
Fuel and electricity	4·0	3·8 [a]	23	21	23 [f]	3·6
Household goods	6·4	6·2 [b]	33	41	45 [i]	8·0
Motor vehicles	2·4	3·1 [d]	7	37	59 [j]	12·0
All other (mainly services)	20·1	18·9 [e]	116	138	112 [k]	23·7
Total	87·6	89·7	444	522	605	107·2

* From ratios between real volumes of British and U.S. consumption per head, as given in *The Impact of the War on Civilian Consumption*, p. 140.

[a] Ministry of Labour Index.
[b] Bank of England and Incorporated Association of Retail Distributors 1931–38; carried back to 1929 by index figures of Birmingham Co-operative Society.
[c] R. Stone, *Journal of the Royal Statistical Society*, 1945.
[d] Society of Motor Manufacturers and Traders, *Car Price Index*, and published figures of petrol prices.
[e] Index of Wage Rates.
[f] U.S. Department of Labour and National Industrial Conference Board Retail Prices.
[g] Movement proportional to sum of all other components of the index.
[h] Wholesale prices of cigarettes (weight 0·75) and cigars (weight 0·25), *Survey of Current Business*.
[i] U.S. Department of Labour *House Furnishings*.
[j] *Car Operating Costs Index* provided by Rufus S. Tucker, General Motors Corporation.
[k] Index of Wage Rates.

markets, are given in Gruenbaum's *National Income of Palestine* (data for 1936, re-calculated to 1939).

Data given in *The Impact of the War on Civilian Consumption* enable us to make an independent comparison between Britain and U.S.A. for 1938.

RE-CALCULATION OF PURCHASING POWER OF THE £ IN I.U., 1938

From Table III it will be seen that goods and services worth \$605 at 1929 prices, or 560 I.U. at the rate of \$·924 per I.U. previously obtained, were equated to £107·2 of 1938 purchasing power, giving the £ a purchasing power of 5·22 I.U.

Similarly, goods and services worth £87·6 in Britain in 1938 were equated to \$444 at 1939 prices, or 476 I.U., allowing for the movement in American prices between 1929 and 1939 as disclosed in the table; this gives the £ a purchasing power of 5·43 I.U.

In general, therefore, we equate the 1938 purchasing power of the £ over consumption goods and services (likewise over Government services, net investment, and all other elements in the national income except visible imports and exports, and munitions production) to 5·32 I.U.

Alternatively, we have a cross calculation, showing that goods and services costing £87·6 in 1938 cost £89·7 in 1929. Taking our previous result of 5·27 I.U. to the £ in 1929, these figures indicate a 1938 purchasing power for the £ of 5·40 I.U., a satisfactory agreement with the previous result.

INTERNATIONAL COMPARISONS OF THE PURCHASING POWER OF MONEY, 1946–47

Since the above text was completed it has become possible to make price comparisons for a number of countries for certain commodities in 1946–47. The information has been very kindly supplied by an important international concern which wishes to remain anonymous; the collection of price data is undertaken with a view to adjust-

ing the salaries and allowances of its officers in different countries. This comparison gives more weight to services and less to automobiles than did the previous comparison, which has the effect of valuing the purchasing power of the dollar rather lower (or of other currencies rather higher) than the previous comparison. The weights given to the various items (National Distribution of Expenditure) are intended to represent the relative importance of these items alone. The previous table set out to give weights according to the relative importance of the different items in the whole national consumption, with a " miscellaneous " entry. The weights of individual items will therefore appear considerably larger in this table and should not be compared with the previous table. Weights were obtainable from official statistics for U.S.A. and Britain in 1946, and Eire in 1944, and an approximate estimate of the weights of these items was made for India. For all the other countries weights were inferred from these, taking into account their real income level and any known peculiarities of their distribution of expenditure.

The 1946–47 data do not cover rents ; in order to complete the table these have to be deduced from 1929 data by means of national index numbers.

While enough is not yet known to reach any final judgments on these figures, or to decide whether to alter existing valuations based on 1929, the comparison between the last two columns of the table leads to some interesting hypotheses. For five European countries (Britain, Eire, Belgium, Netherlands and Switzerland) the purchasing power of their currency appears to be 10–25 per cent higher than that deduced from the 1929 data ; the better representation of services in this latter table is the probable explanation. In Canada and Denmark, on the other hand, the currency is now found to have a lower purchasing power than that deduced from 1929 data. The source of this discrepancy might be that the official index numbers have under-stated the rise in prices. (This may also be the case in the Netherlands where the difference between the two columns is less than in Britain, Belgium and Switzerland.)

[contd. on p. 38

TABLE IV

INTERNATIONAL COMPARISONS OF THE PURCHASING POWER OF MONEY, 1946–47

Country	Date of Comparison	National Distribution of Expenditure, 1946										National Distribution of Expenditure Revalued at American Prices									
		Food	Personal Services (not domestic)	Recreation	Household Management and Replacements	Passenger Transport (including car)	Domestic Service	Clothing	Medical	Rent	Total	Food	Personal Services (not domestic)	Recreation	Household Management and Replacements	Passenger Transport (including car)	Domestic Service	Clothing	Medical	Rent	Total
U.S.A. . .	..	·334	·030	·067	·137	·092	·015	·164	·054	·107	1·0	..	..	..	..	..	..	..	..	..	..
Canada . .	Nov. 1946	·380	·035	·040	·134	·070	·022	·161	·028	·130	1·0	·467	·067	·048	·152	·054	·067	·239	·028	·156	1·278
Mexico . .	Aug. 1946	·574	·035	·018	·091	·019	·034	·140	·019	·070	1·0	·770	·088	·025	·129	·020	·116	·138	·037	(·280)	1·603
Brazil * . .	Feb. 1947	·580	·035	·018	·088	·017	·035	·139	·018	·070	1·0	·649	·073	·017	·093	·012	·325	·101	·017	(·210)	1·497
Argentine .	Aug. 1947	·510	·035	·021	·113	·030	·029	·140	·022	·100	1·0	·930	·056	·026	·094	·021	·158	·094	·027	(·200)	1·606
Eire . .	Oct. 1946	·548	·024	·017	·147	·025	·032	·133	·024	·050	1·0	·592	·080	·022	·119	·016	·160	·127	·040	·156	1·312
Britain . .	Dec. 1946	·386	·043	·040	·155	·086	·022	·134	·022	·112	1·0	·482	·196	·053	·157	·055	·058	·154	·035	·213	1·403
Belgium . .	Feb. 1947	·530	·035	·020	·107	·065	·030	·141	·022	·050	1·0	·451	·067	·016	·101	·046	·058	·117	·034	·067	0·957
Netherlands .	Nov. 1946	·500	·035	·021	·113	·055	·029	·135	·022	·090	1·0	·493	·086	·021	·117	·049	·085	·102	·078	·264	1·295
Switzerland .	Oct. 1946	·510	·035	·020	·110	·050	·030	·143	·022	·080	1·0	·406	·062	·018	·085	·024	·084	·098	·037	·101	0·915
Denmark .	Oct. 1946	·500	·035	·021	·113	·032	·029	·148	·022	·100	1·0	·510	·049	·026	·111	·017	·056	·108	·016	·155	1·048
Sweden . .	Nov. 1946	·490	·035	·021	·113	·055	·029	·145	·022	·090	1·0	·455	·048	·023	·079	·026	·066	·115	·015	·083	0·910
South Africa .	Sept. 1946	·550	·035	·018	·100	·023	·032	·131	·021	·090	1·0	·789	·076	·028	·096	·011	·138	·103	·025	·069	1·335
Australia .	May 1946	·440	·035	·026	·125	·075	·025	·150	·024	·100	1·0	·646	·092	·037	·154	·065	·074	·215	·048	·127	1·458
India . .	Nov. 1946	·650	·030	·015	·075	·015	·030	·120	·015	·050	1·0	·612	·078	·021	·069	·003	·239	·117	·010	·245	1·394

TABLE IV (*contd.*)

Country	Date of Comparison	American Distribution of Expenditure Revalued at National Prices										Geometric Mean Price Level U.S.A. = 1	Value of $ in I.U. at Date of Comparison	Exchange Value in $ of National Currency	Purchasing Power in I.U. of National Currency at Date of Comparison	Do. deduced by Index Numbers from 1929 Value
		Food	Personal Services (not domestic)	Recreation	Household Management and Replacements	Passenger Transport (including car)	Domestic Service	Clothing	Medical	Rent	Total					
U.S.A. . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Canada . .	Nov. 1946	·271	·016	·056	·121	·119	·005	·110	·054	·089	0·841	0·811	·746	1·0000	0·920	0·991
Mexico . .	Aug. 1946	·249	·012	·049	·097	·086	·004	·167	·028	(·027)	0·719	0·670	·787	0·2062	0·242	..
Brazil . .	Feb. 1947	·299	·014	·069	·129	·129	·002	·227	·058	(·033)	0·963	0·802	·741	0·0535	0·0494	..
Argentine .	Aug. 1947	·183	·019	·054	·164	·130	·003	·244	·044	(·054)	0·895	0·747	·708	0·2472	0·234	0·250 †
Eire . .	Oct. 1946	·309	·009	·052	·169	·147	·003	·172	·032	·034	0·927	0·841	·764	4·035	3·666	3·16
Britain . .	Dec. 1946	·267	·007	·051	·136	·144	·006	·143	·033	·056	0·843	0·775	·741	4·035	3·858	3·40 ‡
Belgium . .	Feb. 1947	·392	·016	·084	·146	·130	·008	·197	·035	·080	1·088	1·066	·741	0·02285	0·0159	0·0127
Netherlands .	Nov. 1946	·339	·012	·066	·133	·104	·005	·218	·015	·036	0·928	0·847	·746	0·3846	0·339	0·310
Switzerland .	Oct. 1946	·420	·017	·074	·177	·195	·005	·239	·032	085	1·244	1·166	·764	0·2340	0·1533	0·130
Denmark .	Oct. 1946	·327	·021	·055	·140	·172	·008	·226	·076	·069	1·094	1·022	·764	0·2087	0·1560	0·172
Sweden . .	Nov. 1946	·359	·022	·061	·197	·198	·007	·207	·080	·116	1·247	1·171	·746	0·2789	0·1777	0·173
South Africa .	Sept. 1946	·233	·014	·044	·143	·191	·003	·210	·046	·139	1·023	0·875	·778	4·035	3·588	3·53
Australia .	May 1946	·227	·011	·047	·111	·106	·005	·115	·027	·084	0·733	0·709	·862 §	3·25	3·952	3·53
India . .	Nov. 1946	·355	·011	·047	·148	·419	·002	·168	·080	·022	1·252	0·948	·746	0·303	0·238	..

* An article in *Estadistica*, December 1944, indicates that the purchasing power of 13 milreis at that date was equivalent to that of $1, indicating an average purchasing power of the milreis of 0·058 I.U. Carried forward to 1946 this indicates a purchasing power of what is now called the cruzeiro of 0·0445 I.U. at that date, somewhat less than the figure given in this table.

† Deduced from the approximate result for 1940 given in the text above.

‡ Deduced by using index number of consumption prices given in the *White Paper*.

§ The validity of this datum is open to question—the Labour Department index number on which it is based became unrepresentative during the price-control period, owing to extensive black marketing and "trading up" (*Survey of Current Business*, November 1945, p. 15). This figure, and consequently the estimate of the purchasing power of the Australian £, should, therefore, be reduced by about 10 per cent. This question does not arise for any other country except Australia, as in all the other countries the comparison was made after June 1946, i.e. after the abolition of American price control.

In Sweden, South Africa and Australia, the 1929 calculations are quite closely confirmed (reducing the 1946 figure for Australia from 3·88 to 3·49 I.U. for the reason given in the footnote to the table). This may be the result of a cancellation of moderate differences in opposite directions; the increased representation of services might have been expected to raise the apparent purchasing power of money in these countries, though to a less extent than in Europe; which effect, however, may have been cancelled by some failure on the part of the official index numbers to reflect the true change in prices since 1929.

A very interesting series of figures were published in *Études et Conjoncture*, March-April 1949, comparing prices in France with those in U.S.A., Britain, Italy and Belgium. The price comparisons related to 1938 and January 1949, and referred to 17 items of food, 3 items of fuel, 4 items of clothing, 7 items of building materials and 6 miscellaneous articles of consumption. A series of weights based on relative importance in the French economy is also given. It is not difficult, however, to calculate the data on any other system of weighting, if required. Unfortunately, there are a number of gaps in the data. But they would well repay more detailed examination.

It is clear from the above that information for international price comparisons is available in varying amounts for different commodities, but that it is for the most easily standardisable commodities that the information is most abundant, for anything in the nature of services most scanty.

For this reason we should greatly welcome a special study by Professor Livi [1] showing for 1948 an international comparison of the costs of "tourism" (i.e. travelling on holidays). Professor Livi's inquiry concentrates on just those service items for which other information is so scanty. His comparisons of hotel charges automatically include, with a more or less appropriate weight, a valid measure of true economic rents. This information is hard to obtain from any other source; because the figures for rents

[1] Published in the periodical *Index*, Florence, 15th November 1949.

actually charged in most countries refer either to the majority of dwellings where the rent has been kept artificially low by Government regulations, or to the minority where the rent has been artificially raised by the shortage of available dwellings (which is itself a consequence of rent regulations).

An international comparison of the purchasing power of money in five countries in 1948 is therefore made on the basis of two components only: the price of food and Professor Livi's measure of the price of tourist services. No alteration is made to Professor Livi's weighting of the different services in his total; they represent approximately what a tourist, with fairly expensive tastes, might spend in one day.

For European cities, hotels were classified "superior" or "medium" in the usual manner of guide-books; for New York, where the services are much more standardised, a single entry is made for "medium". For European cities the cost of rooms with private baths is recorded for "superior" hotels; without, for "medium". In America the room with private bath is now universal.[1]

Probably the fairest international comparison, therefore, is to compare "medium" in New York with the mean of "superior" and "medium" elsewhere.

European railways have three (sometimes four) classes, and Professor Livi has imputed first-class railway travel in his "superior" columns and second-class in his "medium" (first and third-class respectively in England, where second-class has been abolished). For America he gives "coach" rather than "Pullman" fares. In view of the fact that our only American data on fares are "coach" it is thought better to amend Professor Livi's total by making the rail fares in Europe second-class throughout (third-class in England). To travel first-class on European railways (used by very few people) is to enjoy a degree of luxury far above that of the American Pullman. (Table on page 40.)

[1] The organiser of an international conference in a European city once recounted the interesting fact that the Europeans wanted to stay at the best hotels but did not mind whether their rooms had private bathrooms; the Americans insisted on private bathrooms but did not mind staying in the second-class hotels.

TABLE V

Cost of "Tourism"

	Rome, Naples, Venice, Florence		Paris		Zürich, Berne, Geneva		London		New York
	Superior	Medium	Superior	Medium	Superior	Medium	Superior	Medium	Medium
	Lire	Lire	Francs	Francs	Sw. Frs.	Sw. Frs.	s. d.	s. d.	$
Room	1940	800	970	540	18·67	6·33	32 9	15 0	5·00
Room service	337	127	140	81	2·24	0·76	4 11	2 3	..
Room tax	135	51	68	38	..	..	..	..	0·25
Light meal	312	244	250	200	2·50	2·08	3 6	3 6	0·50
Two main meals	2112	1613	1266	900	14·84	10·78	18 4	10 0	2·75
Service charge at meals	436	279	182	132	1·73	1·29	..	..	0·33
Tax on meals	72	55	..	..	..	..	..	..	..
Afternoon tea	240	150	85	55	1·65	0·80	4 3	2 6	0·25
150 km. journey by rail	1710	1140	960	630	30·00	21·0	31 3	19 0	3·13
Porter	60	60	30	30	0·80	0·8	0 9	0 9	0·25
5 km. journey by taxi	578	578	145	145	6·07	6·07	3 6	3 6	0·75
Two tram or bus journeys	40	40	30	30	0·46	0·46	0 3	0 3	0·20
Shirt laundered	222	172	60	60	1·50	1·50	1 9	1 9	0·25
Seat at cinema	233	233	160	160	2·40	2·40	8 6	8 6	0·85
Miscellaneous	262	172	105	105	2·23	1·34	3 1½	1 9	0·48
Total	8689	5714	4441	3106	85·09	55·61	112 10½	68 9	14·99
Do., second-class on rail	8119	..	4111	..	76·09	..	100 7½	..	..

It now remains to combine these data with food prices to get a general index of the purchasing power of money. For this purpose we use the *International Labour Review's* comparison of food prices in October 1948, to which date Professor Livi's figures are presumed to be applicable. As the relative importance of food and other expenditure varies greatly between countries an "ideal" index number is used, i.e. the comparison is worked out first on American weights, then on weights of the European country concerned, and a geometric mean taken of the two results.

From various data we take an estimate of \$1·5 per day as American food consumption per head. The cost of this quantity of food, in each country, is deducted from Professor Livi's total, leaving us with as good a measure as we can get of prices in the services industries proper.

TABLE VI

	Italy	France	Switzerland	United Kingdom	U.S.A.
Cost of food equivalent to \$1·5 per day in U.S. \$	1·38	1·68	1·20	0·72	1·50
	Lire	Frs.	Sw. Frs.	d.	\$
Do. national currency	794	361	5·19	42·9	1·50
Tourist expenditure per day*	6916	3608	65·85	1016·0	14·99
Do. less cost of food .	6122	3247	60·66	973·1	13·49

* Mean of "superior" and "medium", with second-class railway fares throughout.

We now have, for each country, the price, measured in national currency, of certain specified services, all food expenditure being excluded. Let us first combine this with food expenditure using European weights. The method which will minimise the arithmetic is to take the results from the previous table showing the price of a specified volume of services, and to combine it with the price of *varying quantities* of food. For this purpose we impute to each country such food expenditure, expressed in national currency, as is necessary to give the correct weighting. Thus in Italy (not in any of the other countries) food

represents more than half the total national expenditure (expressed in lire), and if expenditure on services is lire 6122 we must therefore include an expenditure on food of lire 6375. In England, on the other hand, food expenditure is less than 30 per cent of the whole.

TABLE VII

	Italy	France	Switzer-land	United Kingdom
	Lire	Frs.	Sw. Frs.	d.
Tourist expenditure per day* less cost of food	6122	3247	60·66	973·1
Food expenditure (national currency)	6375	2166	27·22	384·0
Food expenditure ($)	11·09	10·10	6·31	6·45
Price of such food in U.S. $	11·98	8·99	7·83	13·57
Price of food and services in U.S. $	25·47	22·48	21·32	27·06
Do. in national currency	12,497	5413	87·88	1357·0

* Mean of "superior" and "medium", with second-class railway fares throughout.

In the fifth line we simply add the price of services in U.S. ($13·49 as shown in Table VI). The sixth line is the combined price of food and services in national currency, i.e. the sum of the first two lines. Comparison of the fifth and sixth lines will give the relative purchasing power of the national currency and the dollar (comparison made in Table IX) using European weights.

We now prepare a comparison using American weights. If the service expenditure of $13·49 is taken to represent all non-food expenditure, the amount of food which must be added to give the correct relative weight is that costing $6·46.[1]

The result in the last line must be compared with $19·95, the combined cost of food and services in U.S.

European and American weights, it is seen, give exactly

[1] It is interesting to note that the proportion of income spent on food is higher in U.S. than in Britain, in spite of the much higher level of real income in the former country. This curious result is due, of course, to the heavy subsidisation of food prices in Britain.

the same results for France and only a little different for Italy and Switzerland. For Britain the differences are considerable.

TABLE VIII

	Italy	France	Switzerland	United Kingdom
	Lire	Frs.	Sw. Frs.	d.
Price in Europe of food costing $6·46 in U.S. . . $	5·94	7·24	5·17	3·105
Do. national currency .	3318	1553	22·4	185·0
Add tourist expenditure, excluding food . . .	9440	4800	83·06	1158

We can finally give a table of comparisons of the purchasing power in I.U. of the different currencies obtained above and those deduced from the earlier work of 1929 and 1946–47 brought up to date by means of index numbers. The base for converting Professor Livi's results is the 1948 purchasing power of the dollar. Since the recent re-

TABLE IX

Relative Real Purchasing Power of Different Currencies

	Italy	France	Switzerland	United Kingdom
	Lire per $	Frs. per $	Sw. Frs. per $	$ per £
European weights . .	491	240·5	4·115	4·79
U.S. weights	473	240·5	4·16	4·14
Geometric mean . . .	482	240·5	4·14	4·45
Exchange—Official . .	575	215	4·32	4·03
Free . . .	662	313	3·89	..

valuation of U.S. real income (see *Review of Economic Progress*, March 1951), we can measure this with greater accuracy by comparing money gross product for 1948 with the same re-valued at 1939 prices. This equates the 1948 dollar to $0·5435 of 1939 purchasing power, or 0·6165 I.U.

The three calculations were on very different bases, and national index numbers are becoming increasingly

unreliable for the measurement of time trends. (For France the retail index number now measures food prices only, and

TABLE X

PURCHASING POWER OF NATIONAL CURRENCIES IN I.U., 1948

	Italy	France	Switzerland	United Kingdom
Deduced from Professor Livi's results	0·00128	0·00257	0·149	2·75
Deduced from 1946–47 results	. .	. .	0·146	3·57
Deduced from 1929 results .	0·00108	0·00235	0·124	3·15

since 1938, the wholesale price index number had to be used.) At the same time it is disappointing that the results are not closer.

Some confirmatory evidence can be obtained from the surveys of living costs in Italy and France published in *International Reference Service* (Vol. V, No. 82, November 1948, for Italy, and Vol. V, No. 56, August 1948, for France). Scattered data for various non-food prices given for Italy give quite a good confirmation of Professor Livi's figure. For France, on the other hand, the compiler states that at the free exchange rate then current of 300 francs to the dollar, " the costs of living in Paris are equal to those in comparable large American cities such as New York, Chicago or Los Angeles ". This gives the franc an effective purchasing power of 0·00206 I.U.

For the four countries concerned — Italy, France, Switzerland and United Kingdom — Professor Livi's results, adjusted in the manner described above, seem to be more comprehensive and up to date than any alternative figures, and are used therefore for computing present-day real income.

We now have sufficient price material to make a simple comparison of real income per head between a number of countries in 1950 or adjacent year (pre-war incomes in the cases of Poland, Hungary, Czechoslovakia and Yugoslavia). The basing of Japanese prices on 1934 is explained in more

detail later, and no entry is made at this stage for Soviet Russia, where the extraordinary nature of the pricing system requires very detailed analysis (see also later).

These results must only be taken as a first indication of orders of magnitude, and in some cases will be amended later. No account has yet been taken of the varying proportions of the population who work in different countries, or the varying length of working hours ; if these factors were taken into account, the differences between countries would be even wider than they are, because in the wealthier countries the labour force generally constitutes a smaller proportion of the total population, and hours are shorter.

In certain cases more detailed study later will slightly alter the figure for 1950 real income expressed in I.U., because of slightly different treatment in the valuation of imports and exports, and of home-consumed farm products.

Even so, among the countries shown, we get a 15 to 1 range of real income per head, between the United States and Yugoslavia. The runners-up to the United States seem to be Switzerland, Canada and New Zealand. Britain has now been overtaken by Denmark and will shortly be overtaken by Sweden ; France now finds herself in a position well down on the list.

Some of the countries treated in the above table could better be analysed by a valuation in O.U. Any country with a total real income per head of population of less than 100 I.U., as measured in this manner, had probably better be analysed in O.U.

There remain a number of countries, with real incomes above 100 I.U. per head, for which fairly good statistics of money national income are available, but for which we have no price data other than the food and fuel price comparisons published by the International Labour Office. Whatever may have been the case in the past, examination of modern data for a large number of countries shows that there is no consistent relationship between the results derived from international comparisons of food and fuel prices, and results derived from more complete price comparisons. The differences may be wide, depending upon the policies

[*contd. on p.* 48

TABLE XI

Country	Purchasing Power in I.U. of One Unit of National Currency					Value of National Income in 1950 or Other Year indicated			
	Base Date	Value at Base Date	Value in 1950	Value in Other Years (if 1950 Income Figures not available)		In Billions of National Currency		In Millions of I.U.	I.U. per Head
						Factor Cost	Market Price		
Argentine	Aug. 1947	0·234	..	0·212	(1948)	..	31·0	6,572	403
Australia	(see below)		..	2·22	(1949–50)	(see below)		5,254	652
Austria	1929	0·166	..	0·0475	(1949)	29·2	31·9	1,515	219
Belgium	Feb. 1947	0·0159	0·01395	..	..	267·0	312·0	4,352	503
Brazil	Feb. 1947	0·0494	..	0·0441	(1949)	170·0	181·0	7,982	157
Canada	Nov. 1946	0·92	0·704	..	..	14·56	16·51	11,623	847
Colombia	1945	0·4	0·21	..	..	5·57	5·77	1,212	108
Cuba	1945	0·626	0·566	..	..	1·68	1·9	1,077	201
Czechoslovakia	1929	0·0405	..	0·0405	(1938)	56·7	62·5	2,531	173
Denmark	Oct. 1946	0·156	0·139	..	..	19·01	20·57	2,859	670
Dominican Republic	1945	0·584	0·48	..	..	..	0·335	161	76
Finland	1929	0·0286	0·00345	..	..	412·0	495·0	1,708	425
France	1948	0·00257	0·00196	..	..	7,117·0	8,327·0	16,321	389
Germany	1938	0·358	0·237	..	..	71·7	83·8	19,860	416
Greece	1929	0·0151	..	0·0000465	(1949)	19,146·0	21,000·0	977	132
Hungary	1929	0·169	..	0·191	(1939–40)	..	~~5·94~~	1,135	123
Ireland	Oct. 1946	3·666	3·3	..	..	360·0	401·0	1,325	446
Italy	1948	0·00128	0·00128	..	..	6,604·0	7,478·0	9,571	207
Japan	1934	0·73	0·0034	..	..	3,230·0	3,450·0	11,730	142
Mexico	Aug. 1946	0·242	0·185	..	..	29·8	30·4	5,624	219

Mexico	Aug. 1946	0·242	0·185	..	..	29·8	30·4	5,624	219
Netherlands	Nov. 1946	0·339	0·279	..	..	15·58	17·7	4,938	488
New Zealand	1949	2·97	..	2·94	(1949–50)	0·478	0·512	1,505	792
Norway	1929	0·23	0·133	..	..	12·9	13·66	1,817	555
Poland	1929	0·162	..	0·266	(1938)	..	17·2	4,575	131
Spain	1929	0·285	0·0554	..	..	151·8	165·0	9,141	328
Sweden	Nov. 1946	0·1777	0·162	..	..	23·2	25·4	4,110	585
Switzerland	1948	0·149	0·152	..	..	18·09	19·07	2,899	903
Turkey	1938	1·02	0·284	..	..	8·28	9·07	2,576	123
Union of S. Africa	Sept. 1946	3·588	..	3·08	(1949–50)	0·939	0·99	3,049	250
United Kingdom	1948	2·75	2·6	..	..	(see below)		31,740	631
United States	1925–34	1·0	0·61	..	..	(see below)		159,400	1053
Yugoslavia	1929	0·018	..	0·0229	(1938)	39·6	47·5	1,088	71

Countries for which Price Comparisons based on Food and Fuel Prices Only	Base Date	Value in I.U. at Base Date of 1 Unit of National Currency	Year of Comparison	Value in I.U. of 1 Unit of National Currency	National Income in Billions of National Currency		National Income in Millions of I.U.	I.U. per Head
					Factor Cost	Market Price		
Bulgaria	Oct. 1938	0·0184	1938	0·0184	51·3	55·0	1013	162
Chile	Oct. 1950	0·01097	1943	0·0373	32·0	35·2	1316	254
Luxemburg	Oct. 1948	0·01393	1949	0·0132	..	8·0	116	393
Malaya	Oct. 1950	0·252	1948	0·267	3·22	3·49	933	157
Panama	Oct. 1950	0·545	1943–44	0·620	0·129	0·141	87	129
Peru	Oct. 1950	0·077	1949	0·089	..	10·11	901	109
Portugal	Oct. 1950	0·028	1950	0·0275	35·4	37·3	1028	121
Puerto Rico	Oct. 1950	0·664	1945	0·755	0·587	0·645	487	239
Roumania	Oct. 1938	0·00947	1939	0·0088	245·0	260·0	2290	115
S. Rhodesia	Oct. 1950	3·04	1948	3·52	0·0673	0·0697	246	127
Uruguay	Oct. 1950	0·336	1948	0·338	1·333	1·55	524	225

which different countries pursue concerning food production and sale. There thus seems to be no purpose served by trying to refine these crude comparisons of food and fuel prices, and it must be borne in mind that results obtained from them are subject to a wide margin of error.

Before we leave the subject of international price comparisons, a review of data for years earlier than 1929 may be made.

Investigations by the Massachusetts Department of Labour (quoted by Jeans, *Journal of the Royal Statistical Society*, 1884, page 642) showed that in 1883 Massachusetts prices were 17·3 per cent higher than British, two-thirds of this being due to higher rents. Thomas Brassey in *Work and Wages* (1872) puts American prices at a third higher than British. Between that date and 1880 American prices fell by 23 per cent and British by 10 per cent, making American prices exceed British at the later date by the factor 1·14. (Prices were probably lower in the South but higher in the West: a weighted average for the whole of U.S.A. might be expected to give a result far below the Massachusetts average.) The purchasing power of the dollar (see below) stood at about 2 I.U. in 1880. British cost of living rose[1] by 56 per cent between 1880 and 1929 (Bowley, *Wages and Income*, page 30), and the purchasing power of the £ in 1880 can therefore be put at $5{\cdot}27 \times 1{\cdot}56 = 8{\cdot}24$ I.U. or 4·12 times the current purchasing power of the dollar: in other words, that American prices were below British in the proportion $\frac{4{\cdot}12}{4{\cdot}87}$ or 0·845, as compared with the contemporary estimate of 1·17 in Massachusetts (which was subject to the proviso that Massachusetts prices might exceed the U.S. average).

From the same source it is ascertained that French, Belgian and German prices at that date were below British in about the same ratio as American prices were above British. French consumption prices rose 5·28-fold between 1880 and 1930 (see French national income table).

[1] This is a "consumption" price including imports. The price index applicable to value of British *output* showed a considerably larger rise.

German prices in 1877–85 (see national income table) stood at 0·5825 on a 1925–34 base or 0·524 on a 1929 base, giving the mark at that date a purchasing power of 0·462

TABLE XII

PRE-1929 INTERNATIONAL PRICE WAGE AND HOUR COMPARISONS

(United Kingdom = 1)

Source	Prices of—				Weekly Money Wages	Hours
	Food	Rent	Fuel	Other		
Board of Trade Reports :						
Belgium 1905 . . .	0·96	0·61	1·26	..	0·63	1·21
France 1908 . . .	1·11	0·8	1·69	..	0·75	1·17
Do., calculated back from 1929	1·14	0·94	1·47	..	..	..
Germany 1905 . .	1·16	1·01	1·25	..	0·83	1·11
Do., calculated back from 1929	0·96	1·5	1·15	..	..	..
U.S. 1909	1·25–1·39	2·08	..	..	2·3	0·96
Do., calculated back from 1929	1·01	1·64	..	..	..	..
Mundella JRSS 1878 :						
Zurich	..	1·72	..	..	..	..
Canadian Royal Commission on Prices 1915 :						
Canada 1913 . . .	1·12	..	..	1·18 (clothing)	..	..
S. Africa 1913 . .	1·4	..	..	..	..	..
Australia 1912 . .	1·08	..	..	..	..	..
Netherlands 1912 . .	1·095	..	..	..	..	..
Wood JRSS 1904 :						
New South Wales 1898 .	1·75 (basis) (U.K. 1904)	..	..	..	..	..
South African Economic Commission 1913 :						
The Rand . . .	1·56	4·35	..	2·15	0·68	..
Rest of S. Africa . .	1·4	3·48	..	..	1·59	..
France	1·12	0·96	..	..	1·52	..
Germany	1·09	1·22	..	..	0·73	..
Belgium	0·95	0·74	..	..	..	..
U.S.A.	1·29	2·04	..	..	1·6	..
Canada	1·33	1·95	..	..	..	..
Australia	..	2·0	..	..	..	..
New Zealand . . .	..	2·0	..	..	..	..
Norway	..	1·3	..	..	..	..

I.U., i.e. at a purchasing power ratio of 17·8 to the £, as compared with its exchange rate of 20·4, making German prices below British by a factor of 1·15.

Jeans thought that in 1880 both Canadian and Australian retail prices were just about the same as British.

Reference may also be made to some interesting information collected by Brassey in the course of his experience as a railway construction contractor in different parts of the world, and published by him in his book *Work and Wages* in 1872. He found that at that time Canadian costs of living did not exceed British (see also Jeans's results above). In Europe the price of food at that time was 20–30 per cent higher than it had been twenty years earlier, but still below British. Rents, and the price of clothing, he found about equivalent to British; but fuel prices in Europe were twice those prevailing in areas near the coal mines in Britain. The weekly charge for board and lodging for an unmarried working man was 8s. per week in Britain in 1872, 10s. per week in New South Wales, and the equivalent of 20s. per week in U.S.A. This charge of course includes a service element, which would have been much more costly in U.S.A.

We must now discuss the methods, and assemble the available evidence, for stating national products in terms of O.U. First we consider agricultural, fishery and forestry output, then the production and distribution of other physical goods, then services.

The *Report of the Indian National Income Committee* gives the aggregate value of farm and fishery output in 1948–49 (in the hands of the producers before any distributive costs are incurred) at 40·9 billion rupees, but unfortunately it does not give a detailed breakdown of quantities and prices. If it did, we should still be up against the difficulty that for part of that year, in most areas in India, rationing and price control prevailed. Not only would an estimate have to be made for black market trading; the existence of rationing and price control distorts the whole structure of relative prices and makes the data unsuitable for international comparisons.

TABLE XIII

Indian Output and Prices of Farm Products

	Output less Seed Fodder and Waste 1948–49, '000 metric tons	Prices Rupees per Metric Ton				Value at 1931–32 Prices, million rupees
		1931–32		1950–51		
		Given by Prof. Rao	As shown from Other Data	Whole-sale	Retail	
Wheat	4,701	66·5	..	450	..	313
Barley	1,760	50·5	..	443	..	89
Maize	1,722	47·1	..	349	..	81
Jowar	4,218	58·1	..	215	..	246
Bajra	2,010	59·3	..	402	..	119
Millets	2,498	..	50	378	..	125
Cleaned rice	21,220	92·5	..	..	..	1963
Roots and tubers†	963	..	80	408	..	77
Sugar	4,517	..	100	..	..	452
Gram (pigeon pea)	3,561	58·2	..	..	..	206
Ground nut in shell	2,698	85·5	..	..	..	231
Sesame	293	150·0	..	..	..	44
Other pulses	2,411	..	50	..	..	121
Cocoanut, fresh	1,000	..	100	..	..	100
Vegetables	5,486	..	9	..	**	49
Fruit	8,390	..	21	‖	¶	176
Beef and veal	341	310·0	..	..	1369	106
Pork	23	..	519	..	2365	12
Mutton	374	550·0	..	..	2500	103
Poultry and game	35	..	539	..	..	19
Eggs	27	..	1065	3865*	5025‡	29
Fish	401	145·0	..	..	..	58
Milk	15,345	169·0	..	742§	899	2595
Copra	228	50·0	..	..	..	11
Linseed	420	95·0	..	..	..	40
Other oil seeds	738	109·3	..	..	..	80
Tea	254	938·0	..	..	..	237
Tobacco	237	346·0	..	..	..	82
Cotton, ginned	477	595·0*	..	..	..	284
Jute	566	115·5	..	..	..	65
Rubber	16	67·5	..	..	..	1
Wool, greasy	25	425·0	..	7970	..	11
Total	..	..	..	..	..	8147

* Including the value of seeds.
† Potatoes.
‡ Assumed average weight: one ounce.
§ Wholesale price of butter 5170; ghee 5410.
‖ Wholesale price of oranges 7½ rupees per 100.
¶ Retail price of oranges 11½ rupees per 100, bananas [illegible] rupee per dozen, mangoes 1·6 rupees per dozen, raisins 1¼ rupees per lb., lady fingers ¼ rupee per lb.
** Retail price of vegetables, converted to rupees per ton: peas 730, tomatoes 737, cauliflower 724 (0·35 rupee each).

A monthly review of markets and wholesale and retail prices of farm products has been published for some years by the Indian Department of Agriculture. This now contains valuable information, particularly about livestock products, fruit and other commodities, about which information was previously very inadequate. But most of these data are not available for 1948–49 — it is only subsequently that they have become available. And the prices of all the principal grains appear to be still somewhat distorted by rationing and price control.

It was necessary, therefore, to adopt the following rather roundabout device. Precise quantities of Indian output in 1948–49, less consumption for seed and fodder and waste, are available in the Food Balance Sheet submitted by the Indian Government to F.A.O. To these are applied the average prices per ton prevailing in 1931–32 as shown in Professor Rao's book, *The National Income of British India*. For livestock products (other than fish), fruit and vegetables, Professor Rao's data were revised and supplemented by the more recent information adjusted for the change in the general level of prices between 1931–32 and 1950–51.

The 1948–49 quantities, multiplied by the prices (actual or hypothetical) of 1931–32, gave a total of 8·15 billion rupees, or almost exactly one-fifth of the actual income recorded for 1948–49. The 1931–32 prices multiplied by 5 are therefore taken as standards for converting to O.U. figures of output, trade or consumption of farm products.

This method is not entirely satisfactory, but it does at any rate give an aggregate agricultural production which accords with the recorded Indian figure for 1948–49, and as we are choosing in any case an arbitrary base for our new series the use of 1931–32 figures multiplied by 5 will not do any serious harm.

These prices, therefore, can be applied to the statistics of crop and livestock production which are available (in the F.A.O. study on national food balance-sheets) for a number of low-income countries. An entry can also be made for

each country's forestry output. The net value of India's forest production in 1948–49 was 600 million rupees, and we can express the forestry output of other countries in O.U. by the proportion which their output of timber in cubic metres (as shown by F.A.O. statistics) bears to India's.

The next category which we must consider is the production, and also the distribution, of mining, industrial, handicraft and building products. A number of countries have these statistics in their own currency. These are all converted into rupees at the current rate of exchange. We must raise the recorded values by some 25 per cent to allow for the value added by distribution. At this stage we should also allow for the values created by the distribution of imported goods, estimated at about 30 per cent of their value.

This method assumes that the purchasing power of money over this class of goods in different countries is reasonably well measured by current exchange rates. This is probably true when comparing one low-income country with another, though it is not the case in comparing low-income with high-income countries. At 1950 rates of exchange, the retail price of manufactured goods, in certain low-income countries, was about 35 per cent below the retail price in U.S.A. Much of this was due to lower distributive costs ; the prices of such goods at works were only about 20 per cent lower in the low-income countries. Construction costs, on the other hand, in the low-income countries may have been as little as one-sixth of the cost of comparable work in the U.S.A. — for the obvious reason that construction cost is always predominantly a labour cost.

In Table III (international comparisons of the purchasing power of money for the period 1946–47) the only low-income countries which could be brought into the comparison were Mexico, Brazil and India. In the field of manufactured goods, comparison was made of the prices of clothing, of the goods required for household management and replacement, and for motor-car operation. In each country, these data were combined by the use of local rather

than American weights (if we reversed the procedure we would give a very much higher weight to motor-car operation, which in these countries is at a much higher relative cost than in the U.S.A.).

For these commodities, weighted as indicated, and converting currencies at the then ruling rates of exchange, it is found that Indian prices were 11 per cent above those prevailing in U.S.A., Mexican prices 15 per cent above, and Brazilian prices 16 per cent below. It appears, however, that the position prevailing at that date was not typical. Both the importation of goods and the exchange value of the currency were, in most countries, closely controlled, and the wholesale revaluations of their currency which many countries found necessary in 1949 is an indication of the disequilibrium prevailing in the preceding years.

In Table XIV these prices ascertained for the three countries are carried forward to 1950 and back to 1938, in comparison with the U.S.A. prices prevailing in the same period. For U.S.A. the wholesale price index number of manufactured goods is used (it is assumed that the retail prices moved in approximately the same proportion). For the other countries no such index numbers were available, and general index numbers of retail prices therefore had to be used to carry the prices of manufactures backward and forward, except that for Brazil a wage index number was available for the period 1947–50.

It will be seen that in both 1938 and 1950 — years in which the exchange rate seems to have been in better equilibrium with purchasing power parity than in the immediate post-war years — the retail prices of manufactures in these three countries were a long way below the American level.

Data given in the Indian national income report indicate that the retail price of manufactured goods, on the average, was only some 25 per cent higher than the price of such goods at their place of production or importation. In the study of the Yugoslavian economy made by Professor Bicanic the corresponding proportion was only 21 per cent. For the United States, Professor Kuznets's figures given in

TABLE XIV

Price of a Quantity of Manufactured Goods costing $1 in U.S. in 1926

Year	Price in U.S. (Wholesale Price Index) $	Dollar Price in—			Price of Same Quantity of Goods in—			Converted back to $ at 1938 and 1950 Exchange Rates			Mean of 3 Countries	Ratio to Current U.S. Prices
		Brazil	India	Mexico	Cruzeiro	Rupees	Mex. Pesos	Brazil	India	Mexico		
1938	0·822	..	..	..	8·9	1·53	2·06	0·495	0·56	0·46	0·505	0·614
1946–47 Aug. 1946	1·02	..	..	1·172	..	..	5·70	..	..	..	..	..
1946–47 Nov. 1946	1·065	..	1·183	..	..	3·93	..	..	..	..	..	..
1946–47 Feb. 1947	1·102	0·926	..	..	17·3	..	..	..	..	..	..	..
1950	1·568	..	..	..	24·2	4·5	7·51	1·2	0·95	0·87	1·007	0·641

National Product Since 1869, for semi-durable and durable consumer's goods averaged together, show for recent periods a proportion of 60 per cent. The distributive trades involve a much larger element of labour and floor space, and a smaller element of mechanical equipment, than do the manufacturing trades, and therefore the relative cost of distribution might well be expected to be much lower in a low-income economy.

It will be seen therefore that if we express the value of manufactured goods at factory prices, the price in low-income countries is only about 20 per cent below that of the U.S.A.

When we compare rents, however — or construction costs — we find that, for a given amount and quality of dwelling space, rents are very much lower in the low-income countries. (Here, again, this is the result which we should expect; the construction and maintenance of buildings involves a comparatively large proportion of labour and small proportion of mechanical equipment.) In 1946–47 Brazilian rents were found to be only about one-third of those prevailing for corresponding dwelling space in U.S.A., and Mexican rents one-quarter. For India we can make comparisons between construction costs per square foot of American style buildings, which in 1947 were only five or six rupees in India, as against eight dollars in the United States, or about five times as much. Averaging these three results, we find construction costs in the low-income countries in 1946–47 to have been only about 26 per cent of those in U.S.A.

At 1950 rates of exchange, and after allowing for changes in construction costs in the different countries between 1946–47 and 1950, it appears that the ratio has fallen to as low as one-sixth.

These results, though of considerable interest, do not affect our present line of reasoning. Our concern at present is to go ahead using the O.U. as a basis for comparison, irrespective of what its relative value may be in terms of dollars or I.U. Its calibration against international units will be discussed later.

THE O.U. VALUATION OF PERSONAL AND PROFESSIONAL SERVICES

It is in this field that the most serious inconsistencies arise in the I.U. method of valuation, i.e. re-expressing all data in terms of a dollar purchasing power. In the United States, personal and professional services are getting an ever-increasing relative value compared with commodities. The reason for this, of course, is that little or no technical improvement is possible in the rendering of such services, and the amount of labour required to provide a given service is much the same now as it was a hundred years ago, whereas the amount of labour required to produce a given output of any commodity is nearly always very much less. But the application of these high I.U. equivalents to the output of workers in the professional and personal service industries in low-income countries, or in the distant past, often produces anomalous results.

For the treatment of this problem a highly radical method proposed by Professor Fourastié was adopted. He assumes, in effect, that the real product per person engaged in the professional and personal industries is the same at all times and all places. While this is probably true of certain simple personal services, such as hair-dressing and café service, it is not entirely true in services such as teaching and medicine. In the more economically advanced countries, the practitioners of these professions may be better qualified and give definitely more valuable service, for each day's work done.

Professor Fourastié's generalisation may also not be entirely true in certain of the personal service industries such as laundries and some branches of domestic service. In countries where the worker in these services uses a greater amount of equipment, he may definitely supply a greater volume of service for an hour's work done.

However, for making comparisons between a number of countries all in the low-income stage of development, Professor Fourastié's device provides a most valuable simplification and avoids a number of very difficult

[*contd. on p.* 60

TABLE XV

Valuations of National Products in O.U.

Year	Country	Product of Mining, Manufacture, Construction and Handicraft in Millions of National Currency	Above plus Distributive Costs, plus Distributive Costs on Imports, millions of O.U.	Products, millions of O.U.			O.U. per Head of Population	
				Agriculture and Fishery	Forestry	All Physical Products	Physical Products	Do., plus Allowance for Domestic, Personal and Professional Services
1950	Canada	5,730	36,596	11,540	2,030	50,166	3535	3562
	Ceylon	435	907	1,923	20	2,850	378	400
	Chile	34,290	3,199	1,301	144	4,644	800	817
	Colombia	1,144	2,721	5,066	600	8,487	751	765
	Denmark	7,930	8,099	4,810	34	12,943	3035	3065
	Finland	164,000	4,822	1,670	670	7,162	1761	1778
	France		54,285	19,530	548	74,363	1775	1793
	Germany	37,260	57,018	16,730	588	74,336	1557	1571
	Greece	4,819,000*	7,560	2,650	96	5,306	667	681
	India	15,375†	20,989	40,173	600	61,762	172	192
	Ireland	86	2,107	2,100	7	4,214	1400	1420
	Italy	2,274,000	23,870	13,600	315	37,785	816	834
	Japan	1,070,000	19,104	9,887	920	29,911	361	375
	Netherlands	6,400	13,094	5,510	13	18,617	1840	1861
	Norway	6,510	4,959	3,680	148	9,687	2970	2984
	Turkey	1,236	3,038	4,916	131	8,085	386	404
	Union of S. Africa	367	7,430	3,439	45	10,914	889	914
	United Kingdom	5,435	101,611	11,810	82	113,503	2240	2267
	U.S.A.	1,430	18,053	115,590	6,220	683,643	4500	4543
1938	Argentine	2,040	6,561	13,090	300	19,451	1360	1376
	Canada	1,430	18,053	9,590	1,490	29,133	2580	2607

	Chile	3,880	1,595	1,025	120	2,740	587	604
	Egypt	13	1,230	4,556	0	5,786	361	378
	Finland	9,200	2,654	1,620	1,020	5,294	1458	1477
	France	128,000	45,480	18,430	435	64,345	1560	1578
	Greece	19,400	1,663	2,360	98	4,121	591	605
	Ireland	34	2,381	2,220	7	4,618	1567	1587
	Italy	37,000	23,908	13,010	281	37,199	880	898
	Japan‡	4,220	17,350	11,644	1,610	30,604	453	470
	Netherlands	1,490	11,527	4,890	13	16,430	1915	1935
	Norway	1,470	4,727	2,910	250	7,887	2700	2721
	Poland	5,700	12,980	12,843	380	26,203	750	767
	Turkey	252	2,608	3,847	115	6,570	391	409
	Union of S. Africa	151	9,226	2,697	32	11,955	1222	1247
	U.S.A.	18,400	215,818	85,950	6,900	308,668	2500	2536
	Yugoslavia	13,300	3,800	4,649	344	8,793	579	595
1932	Philippines	394	2,900	3,050		5,950	425	440
1928	Italy	32,000	18,700	14,300		33,000	811	829
1925	Japan	3,005	10,710	11,780		22,490	377	394
1919	Japan	2,473	10,800	11,640		22,440	400	417
1914	Italy	6,000	18,000	10,600		28,600	802	820
1913	Austria	5,512	17,450	10,460		27,910	957	968
1907	Hungary	885	3,000	6,480		9,480	473	487
1890	Norway	88·8	495	800		1,295	647	668
	Switzerland	830	3,300	1,420		4,720	1625	1643
1859	Austria-Hungary	1,241	8,100	9,190		17,290	520	538

* 1949. † Raised slightly from 1948–49 to allow for rising prices. ‡ 1935.

statistical and theoretical problems, which arise out of attempts to ascertain the prices and aggregate values of such services in different countries. To apply his formula, we need only information of the proportion of the population engaged in such services. In India in 1948–49 the average net output per person engaged in personal and professional industries was 510 rupees. We can take this as a measure of the O.U. value per person engaged at other times and places. Where a proportion of the labour force is engaged in professional and personal service industries, we multiply this figure of 510 by n, and by a further factor 0·35 to allow for the ratio between labour force and total population. The result so obtained gives us, in O.U. per head of the total population, the value of output of professional and personal service industries.

Measured in this way, such activities appear to represent a very minor part of the economy — as indeed they do in Oriental eyes, in contrast to the increasingly important position which they occupy in the Western economies. This ratio is at its highest, of all the countries examined, in Ceylon, where it stands at one-tenth of the O.U. value of agricultural production. It is interesting to add that, if the real product of the United States is revalued in O.U. instead of I.U. terms, the output of personal and professional services also appears as about one-tenth of the agricultural output (as against approximately one-half on the current dollar valuation).

We now have sufficient data to compile O.U. figures for a number of countries in 1950, and also certain data for earlier years, with one exception — namely data for the value of rents, or dwelling space. It will be shown now that in low-income economies the value of rents bears a fairly closely predictable relation to income, and in each case, therefore, O.U. figures of national product are calculated without allowance for rents, which factor is inserted later. For convenience, these O.U. figures exclusive of rents are used for calibration against I.U. and in other calculations.

HOUSING AT LOW-INCOME LEVELS

We have seen that it is possible to make some estimates of national product expressed in O.U., of primary products and of manufactured goods, and of personal services, in low-income countries. There are no facilities for directly estimating the contribution of housing. Estimates of aggregate annual expenditure on housing (gross rentals) are generally only made by advanced industrial countries. In the few cases where such estimates have been made for low-income countries (e.g. Ceylon) they are generally confined to the annual value of urban housing. As we descend the income scale, of course, a steadily increasing proportion of the population is rural, and such information, even if it were generally available, would be of little value for this purpose.

The method adopted therefore is to study the recorded housing expenditure by low-income families in a number of countries for which family budget studies are available. The available information is summarised in *International Labour Year Book*, 1945–46. Unfortunately, data for most countries are classified by aggregate expenditure per *family*. Families are of different size, and the families with lowest recorded aggregate income generally tend to be of somewhat smaller size than the families with higher income. In order to analyse housing expenditure as a true function of income, we must confine ourselves to the limited number of countries, separately classified in the *Year Book*, in which family expenditure can be expressed *per consumption unit*. In computing consumption units, the International Labour Office has used a scale whereby an adult female is weighted at somewhat less than an adult male, and children are weighted according to their age. The precise scale is not of great importance, so long as the same scale is used consistently for all the calculations, as it is here. When we wish to compare it with figures expressed *per head*, we can get the correct order of magnitude by comparing one consumption unit with one and a quarter persons.

The *Year Book* classifies, for seven countries, income per consumption unit in fairly wide classes, and records rent as

a proportion of total expenditure in each of these classes. As the income classes are wide, while the proportions spent on rent do not vary greatly, the income figures are not interpolated, but the rent proportions are interpolated to show the proportion of income spent on rent at the *lower limit* of each income class. This makes unnecessary the unsatisfactory process of estimating average income in each class (except for the lowest class). Incomes are converted from national currency to I.U. by means of the conversion factors of the year 1929 calculated in Table II, converted to the factor for the relevant year in each country by means of national index numbers of the cost of living. For Colombia and Venezuela factors are computed from data published in the United States Department of Commerce International Reference Service of 1945 and 1946. The Venezuelan data referred directly to the year 1945. The Colombian data are converted back to the year 1936 by means of the national index number of changes in rents.

We now have figures showing expenditure on rent in national currency. As described in Table II, we have comparable data for a number of countries for rents in 1929 (the original data were mostly collected in 1936 and converted back to a 1929 comparison). In order to express our result in physical terms, each money value is now expressed as the number of months' rent which it would pay for one room. The word " room ", it will be remembered, is defined in a special way as a room in a three- to five-roomed house or apartment, supplied with bathroom, closet and running water. This must be borne in mind when interpreting the data, for instance, which show that the poorest families in some countries only spend on rent (assuming four or so persons per family) each year sufficient to pay three or four months' rent on a single room. What this probably means in fact is that people are living five or six to a room, and in dwellings of very much poorer quality than the type equipped with bathrooms and running water which enter into the international index number comparisons. In Oriental cities a considerable proportion of the poorer families live permanently in tents, huts or sheds.

TABLE XVI

	Average Income per Consumption Unit per Year		Average Rent paid per Consumption Unit per Year	
	National Currency	I.U.	National Currency	Equivalent in Room-Months
U.S.A., 1934 . .	180	212	29·7	3·82
	200	236	33·0	4·25
	300	354	50·5	6·48
	400	471	68·9	8·85
	500	589	87·0	11·2
	600	707	105·1	13·5
	700	825	121·2	15·6
	800	942	138·0	17·7
	900	1060	152·1	19·5
	1,000	1179	162·0	20·8
	1,100	1297	171·5	22·0
	1,200	1413	180·0	23·1
Colombia, 1936 .	60	39·6	10·5	0·85
	72	47·5	13·4	1·09
	108	71·1	20·1	1·63
	144	95·0	24·3	1·97
	180	118·8	30·2	2·45
	216	142·3	39·8	3·23
	252	166·0	48·0	3·89
Venezuela, 1945 .	285	30	52·5	0·55
	360	38	62·5	0·66
	720	76	129·6	1·36
	1,080	113	184·8	1·94
	1,440	151	219·6	2·3
	1,800	189	271·0	2·84
	2,400	252	357·0	3·74
	3,000	315	485·0	5·09
Finland, 1928 . .	3,150	90	426·0	1·4
	3,750	108	488·0	1·6
	5,000	143	645·0	2·12
	6,250	179	814·0	2·67
	7,500	215	976·0	3·2
	8,750	251	1122·0	3·69
	10,000	286	1250·0	4·1
	11,250	322	1390·0	4·56
Norway, 1927–28 .	750	160	83·0	2·85
	900	192	112·0	3·85
	1,300	277	173·0	5·9
	1,700	362	203·0	6·9
	2,100	447	298·0	10·2
Poland, 1929 . .	495	80	18·8	1·04
	600	97	24·9	1·38
	900	146	37·8	2·09
	1,200	194	45·6	2·52
Sweden, 1933 . .	640	175	89·0	3·35
	950	258	141·0	5·32
	1,450	395	244·0	9·2

For Colombia and Venezuela average monthly rentals per room are not given in the 1936 comparison from which data for the other countries are obtained. Information on this matter is obtained from the International Reference Service.

When the data of incomes and amount of dwelling-space occupied per consumption unit are plotted on a double logarithmic scale, it is seen that the lines for different countries are all of more or less the same slope, with some differences in level.

If we define annual income in I.U. per consumption unit as y, and room-months of accommodation per consumption unit as x, then the following relationship appears to hold:

$$\log x = 1{\cdot}05 \log y - 1{\cdot}86.$$

For practical purposes, rents represent about 6 per cent of real product at low-income levels.

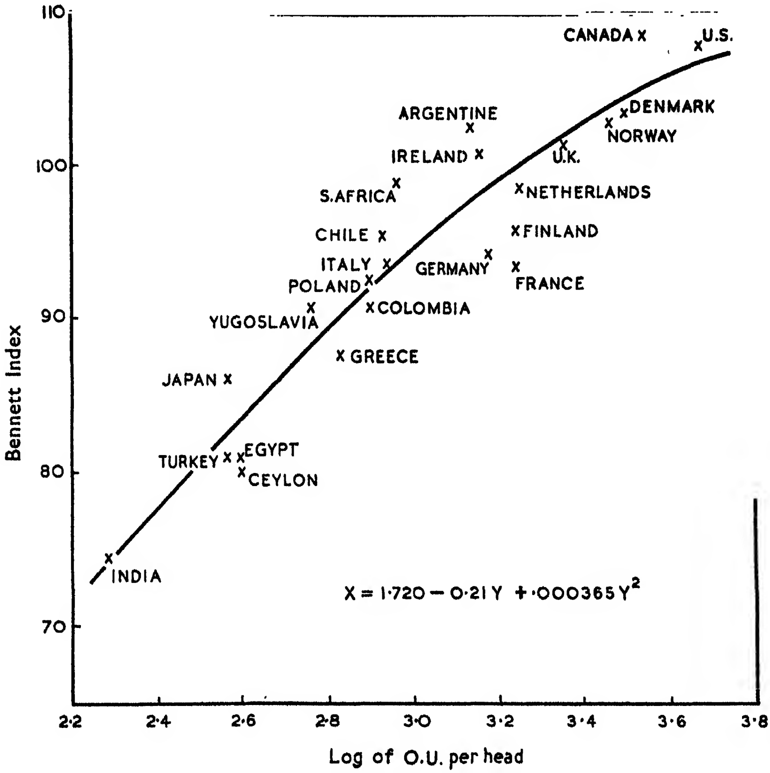
To make use of these results for the lowest-income countries we must now convert I.U. into O.U. As will be seen below, we are dealing with fairly constant ratios, and it does not therefore matter, within fairly wide limits, which conversion coefficient we use.

It remains to express "room-months" in O.U. of expenditure. For this purpose we will assume an average area of 250 square feet per room. Inquiries in India show that for 1948–49 an average construction cost of seven and a half rupees per square foot may be assumed, and an average gross rental of 10 per cent of construction cost. These figures give us 177·5 O.U. per room-year, or 14·8 per room-month.

We now have a fairly simple scale whereby we can adjust all O.U. values (where real income levels are below 1000 O.U. per head per year) to take account of real income received in the form of occupancy of housing. The order of magnitude of the addition is about 6 per cent.

The table for making this adjustment will, however, be combined with more important tables used for converting the "Bennett index" (see pages 22-4 above) into O.U. per head.

The results of the Bennett index compilations are given below, arranged in groups in order of reliability; which reliability is defined by the number of the specified series available. The index is also calculated for a number of high-income countries; not that such results are of any direct use, but they help in the calibration of the Bennett index figures to O.U. per head.



It should be made clear once again that the index is *not* based on any country as 100. It is in fact based on India = 75, which figure was chosen for convenience because there are 25 logarithmic series with 3 digits each. It is not in any way a series indicating real income per head in direct proportion but is more nearly indicative of the logarithm of real income, as will be seen below. The

F [contd. on p. 68

TABLE XVII

BENNETT INDEXES FOR 1950

(Number of Series Missing, out of 25)

	None		1		2		3	
Over 105	Canada	109·0	New Zealand U.S.A.	110·2 108·7	Australia	109·6	..	
100–104·9	Denmark Norway Argentine Sweden Switzerland Belgium	103·7 103·4 102·3 102·0 101·6 100·3	United Kingdom	101·6	Ireland	100·7	..	
95–99·9	Czechoslovakia * Netherlands Finland	99·1 99·0 95·7	Austria	98·2	S. Africa	99·1	Chile	95·3
90–94·9	France Mexico	94·2 91·6	Poland * Yugoslavia *	92·1 90·6	Hungary * Peru Israel	93·3 91·7 90·4	Cuba Italy Portugal Colombia Brazil	94·4 93·3 91·6 90·6 90·0
85–89·9	..		S. Rhodesia Japan	89·2 86·8	Tunis	86·5	Spain Greece	89·6 88·4
80–84·9	Morocco	83·5	Turkey	81·2	Egypt	81·3	Algeria Ceylon	83·2 80·1
75–79·9	India	75·0	..		..		Madagascar Kenya	79·8 77·3
70–74·9	..		..		..		..	
Below 70	..		Belgian Congo	68·7	..		Pakistan	69·1

* 1938 figures.

4	5	6	7	8 or 9
..	..	..	..	..
..	..	Iceland 102·8	..	..
..	..	Uruguay 99·9	..	..
Germany 94·6 Lebanon 92·6 Bulgaria * 91·4	..	..	Bahamas 91·9 Barbados 90·9 Venezuela 90·0	..
Malaya and Singapore 89·9 Syria 85·9	..	Cyprus 89·2 Jamaica 87·2	..	..
..	Dominican Republic 84·3 Bolivia 84·0 El Salvador 83·3 Guatemala 80·0 Philippines 80·0	Ecuador 84·6 Guadeloupe 84·6 Iraq 83·2	British Guiana 82·7	Martinique 84·0
French Equatorial Africa 76·7	..	Iran 76·3 Thailand 75·6	..	..
Mozambique 72·6 Indonesia 71·0 Angola 70·4	Sudan 74·2	..	Gold Coast 72·3 Haiti 71·0	..
Indochina 63·2	Burma 69·3 Tanganyika 68·2 French W. Africa 67·3	..	Nigeria 69·5	Sierra Leone 69·5

* 1938 figures.

countries are grouped in descending order of accuracy as shown by the number of series missing.

TABLE XVIII

Bennett Index	Corresponding Income in O.U. per Head Deduced from Equation	Do. with Allowance for Housing
95	1045	1120
94	935	1001
93	838	897
92	753	805
91	678	725
90	611	653
89	552	590
88	500	534
87	453	484
86	411	439
85	373	398
84	340	363
83	310	331
82	283	302
81	259	276
80	238	256
79	218	232
78	201	214
77	185	197
76	171	182
75	158	168
74	145	155
73	136	145
72	126	134
71	117	124
70	109	116
69	102	108
68	96	102
67	90	96
66	84	89
65	79	84

There are a number of other countries for which some even more scanty information is available, or which can be compared with neighbouring countries in respect of a few of the series only.

For those countries for which both a Bennett index and direct measurement of income in O.U. are available, a diagram can be drawn which shows a fairly satisfactory relationship between the index and the logarithm of O.U. per head. The relationship appears to be slightly curved, and a formula for calculating the logarithm of O.U. per head from the Bennett index is indicated on the diagram.

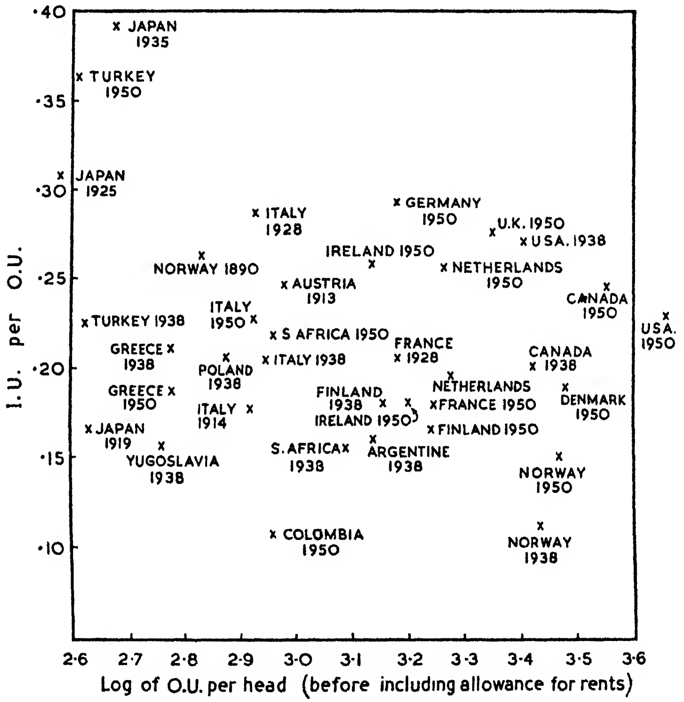
It should be noted that these measurements of income and O.U. per head have been made *before* allowing for housing and this adjustment is therefore made in the final scale.

On these scales, we can effect a conversion for all the countries for which we possess a Bennett index. Even so, as is seen from Table XIX attached, no attempt is made to do anything more than to classify the countries within fairly wide groupings. These are the countries shown under the heading " Computed ". In order to enable this table, at any rate at some low degree of accuracy, to cover the entire world, all the other countries (most of which, in fact, are of small population) are placed according to such indirect indications as are available, in the columns headed " Conjectured ".

Finally, we are bound to ask ourselves what is the order of magnitude of the relationship between a real income expressed in O.U. and a real income expressed in I.U. In the diagram on page 70 all the countries for which comparable data are conveniently available, at any date, are compared. As a range of incomes expressed as O.U. per head is very wide they are converted into logarithms.

In very broad terms, it can be said that when the income in O.U. per head passes 1000 units (log. 3·0), the relationship settles down to about 0·2 I.U. per O.U. At lower income levels, as might have been expected, the ratio tends to be considerably higher. An I.U. valuation of a low income includes an imputation for transport and distributive services on food, which services do not, in fact, have to be performed at all in a simple peasant economy. The lower the real income level, the greater the relative importance of such imputed or imaginary services

to the whole national income, and the greater the number of I.U. therefore deduced per O.U. Once we reach the neighbourhood of 1000 O.U. per head, or higher, the five to one relationship can be used, if we must use a relationship at all. But it will be seen how widely different countries deviate from this norm. The number of I.U. per O.U. is exceptionally low in Norway, for instance, for



the reason that Norway produces a great deal of fish and timber, both of which commodities happen to have a very high O.U. valuation. In the U.S.A. and some other countries, where the ratio of services to total real product is now high, the converse effect occurs, because such services have practically no value at all on the O.U. scale.

After all the above text had been set up in type, a new and greatly improved comparison for five leading countries was published by Messrs. Milton Gilbert and

Irving Kravis, of the Organisation for European Economic Co-operation (*An International Comparison of National Products and the Purchasing Power of Currencies*). While previous studies have referred to the prices of consumable goods and services only, this study also covers the prices of investment goods and of Government services. The price comparison refers to the year 1950, and covers the United States, Great Britain, France, Germany and Italy.

The O.E.E.C. study takes prices in the United States in the year 1950 as its base. Although prices were rising fairly rapidly during the closing months of the year, nevertheless 1950 is probably about as good a base year as we are likely to get. As we now have available this information, so greatly superior to any which has come before, we may begin to use prices in the U.S.A. in 1950, rather than in the now distant period 1925–34, as a base for our unit of international comparison. In order to avoid a good deal of unnecessary arithmetic, we may re-define our I.U. as the quantity of goods and services exchangeable for $1·649 in the U.S.A. in 1950. In this way we can preserve all our old results, based on the period 1925–34, intact, while at the same time compiling subsequent results on a more up-to-date and accurate base.

The price data for relating the year 1950 to the previous base period 1925–34 were obtained in the first instance from the "implicit deflators of gross national product", computed by the U.S. Department of Commerce, and published in *Survey of Current Business*, National Income Number, July 1952. These constitute, by definition, the most comprehensive price series available. They are computed continuously, on a 1939 base, and are available to compare the period 1929–34 with 1950, but not for the years before 1929.

They are extrapolated back from 1929 to 1925 therefore by using the implicit deflators of net national product computed by Professor Kuznets in his *National Product Since 1869* (pp. 55-6; using the "peace-time concept" definition of net national product).

In international comparisons of prices it is known that

widely different results are to be expected, according to whether American or European weights are used; but the differences now seem to be becoming wider. The principal sources of such differences are the relative cheapness of buying and operating automobiles in the U.S.A., and the relative cheapness of domestic and personal services in Europe. In addition, the great differences in national policy of taxing drink, tobacco and similar

TABLE XX

	Prof. Kuznets's Net National Product, $ b.		Implicit Deflator	Implicit Deflators on 1939 Base	
	Current Value	Value at 1929 Prices		As Published	Extrapolated
1925	76·0	74·0	1·027	..	1·237
1926	81·6	79·0	1·033	..	1·245
1927	80·1	79·9	1·002	..	1·207
1928	81·7	80·8	1·011	..	1·218
1929	87·2	86·9	1·003	1·209	..
1930	..	..	..	1·163	..
1931	..	..	..	1·050	..
1932	..	..	..	0·942	..
1933	..	..	..	0·907	..
1934	..	..	..	0·955	..
1925–34 average	..	.	..	1·113	..
1950	..	..	..	1·836	..

commodities also considerably affect the result. The extent of these differences seems to widen as we descend the scale from Britain to Italy.

When the results on the two sets of weights are combined in a geometric mean, it is found that the purchasing power of both the British £ and the German mark is now 7 per cent lower than was previously supposed, but the estimate of the purchasing power of the Italian lira was raised by 9 per cent, and of the French franc by as much as 28 per cent. This revision of the French figures is certainly extensive. Nevertheless, the alternative data on the purchasing power of the French franc show considerable

discordance among themselves, and we have no accurate index number for linking its present-day purchasing power to that of past years; so the new result, though somewhat unexpected, may be accepted.

TABLE XXI

NUMBER OF UNITS OF NATIONAL CURRENCY WITH PURCHASING POWER * EQUAL TO $1 IN 1950

	O.E.E.C. Results		Geometric Mean	Previous Results	Purchasing Power in I.U. of One Unit of National Currency
	U.S. Weights	Other Country's Weights			
British £ .	0·288	0·218	0·251	0·233	2·416
French franc .	313	223	264	339	0·002297
German mark	3·63	2·52	3·03	2·82	0·2001
Italian lira .	577	328	435	475	0·001394

* At market prices, not factor cost.

Still more recently, further information has become available in United Nations Statistical Papers M14 and M14 ADD. 1, comparing retail prices in a number of cities. These will require further adjustment before they can be used for international price comparisons as we require them here, because

(i) most of the comparisons are on New York weights alone (though a few are on a "Fisher" index);

(ii) in countries where low controlled rents prevail, the index is compiled from uncontrolled rents only, whereas to get a suitable price factor to apply to national incomes we need a composite of the controlled and uncontrolled figures;

(iii) the comparisons of transportation costs are not made per mile, but per average journey, whose length varies greatly in different cities;

(iv) in the same way, the amount of domestic service included in the calculations is allowed to vary between cities, in accordance with social customs.

Nevertheless, those data provide a useful approximate comparison, and much more up-to-date than any previous information.

TABLE XXII

Country	City	Date of Comparison	Value in I.U. of U.S. $ at that Date	Prices New York=100	Exchange Rate (Units of National Currency) per U.S. $	Value in I.U. of One Unit of National Currency	Figure hitherto used, adjusted to same Data
Argentine	Buenos Aires	Jan. 1953	·549	92	13·95	0·0428	..
Australia	Sydney	Feb. 1952	·559	78	0·446	1·60	1·59
Austria	Vienna	June 1952	·554	77	26	0·0277	0·0288
Belgium	Brussels	Nov. 1952	·549	84	50	0·0130	0·0126
Brazil	Rio de Janeiro	June 1952	·554	150	18·72	0·0198	0·0323
Chile	Santiago	Dec. 1952	·549	78	18·25	0·00547	0·00817
Costa Rica	San Jose	Nov. 1951	·554	64	7·52	0·115	..
Denmark	Copenhagen	July-Dec. 1952	·549	67	6·907	0·118	0.120
Egypt	Cairo	Jan. 1952	·554	84	0·348	1·89	..
France	Paris	Dec. 1951	·554	99	350	0·00160	0·00132
French Equatorial Africa	Brazzaville	May 1953	·549	130	175	0·00241	..
Great Britain	London	July 1952	·549	76	0·357	2·02	2·18
Greece	Athens	Oct. 1952	·549	134	15,060	0·0000272	0·0000443
Guatemala	Guatemala City	Feb. 1953	·549	93	1	0·590	..
India	New Delhi	Oct. 1952	·549	79	4·76	0·146	..
Italy	Rome	Feb. 1952	·559	88	625	0·00101	0·001225
Mexico	Mexico City	Dec. 1951	·554	84	8·65	0·0764	..
Netherlands	The Hague	June 1952	·554	71	3·805	0·205	0·256
Peru	Lima	June 1952	·554	80	15·8	0·0437	0·0725
Philippines	Manila	Feb. 1953	·549	135	2	0·203	..
Thailand	Bangkok	Oct. 1953	·544	116	19·48	0·0240	..
Switzerland	Geneva	July 1952	·549	87	4·30	0·147	0·146

CHAPTER III

INTERNATIONAL COMPARISONS OF REAL INCOME PER HEAD AND REAL PRODUCT PER MAN-HOUR IN OTHER YEARS

As was indicated in Chapter II, our first measurements of real product require two minor refinements of method before we can go on to compare real products and real incomes over a series of years. These refer to the valuation of farm products which are directly consumed by the producer and his family, and to the valuation of imports and exports. As will be seen below, unless we take care of these points, we may introduce a spurious element into our measurement of the trend of real product.

HOME-CONSUMED FARM PRODUCTS

The greater part of national income measurement, in economically advanced countries, relates to goods or services which are sold or supplied for money. In an industrial community, the most important "unsold" element in national income is the owner-occupied house, to which a value can be fairly closely imputed from the commercial rental value of similar dwellings.

But in every farming community, even in the most highly industrialised countries, there is another unsold element, namely the food which farm families obtain from their own production. In every country such supply is included in official estimates of agricultural output, but then in almost every case the value attached to it is an imputed wholesale value, i.e. what the farmer could have obtained had he sold it.

But from the point of view of gauging the real income and real standards of consumption of a farming

community, of comparing it with other communities, we need to know the imputed *retail* value of such supply. In the case of commodities like milk and meat, the difference between wholesale and retail value is very substantial.

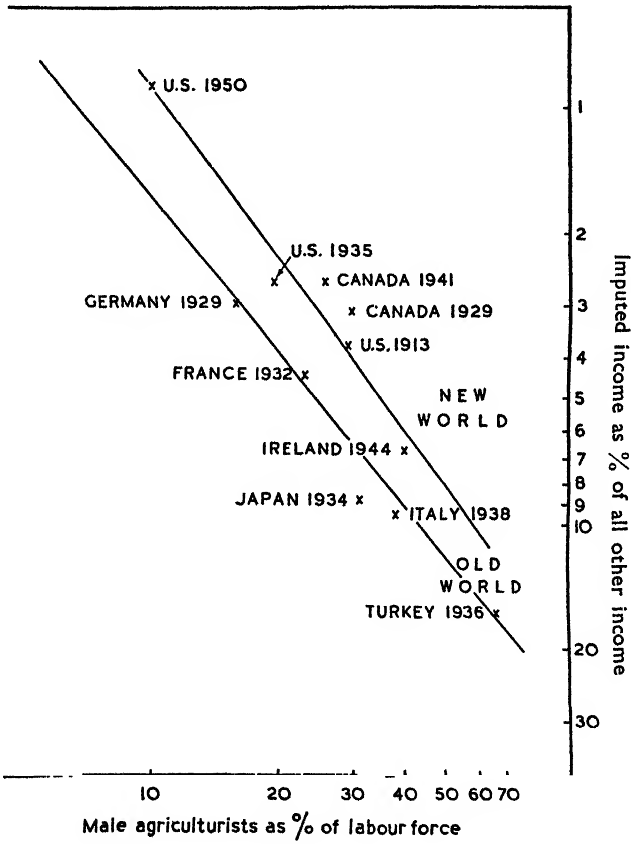
While it will be readily agreed that we should reckon in this manner in estimating standards of real available income, the question may be asked whether this method provides the true measurement for productive efficiency. Consider the case reduced to its simplest elements. A community of peasant proprietors, producing on their

TABLE I

		Agricultural as % of Total Labour Force	Imputation as % Addition to National Income
Canada	1929	30·0	3·1
	1941	26·0	2·6
France	1932	23·8	4·4
Germany	1929	16·0	2·9
Ireland	1944	41·0	6·6
Italy	1938	39·1	9·4
Japan	1934	32·0	8·8
Turkey	1935–36	70·2	16·4
U.S.A.	1913	29·4	3·7
	1935	20·0	2·6
	1950	10·1	0·9

own farms most of the food required by their families, is converted into a partially industrial economy by transferring a number of workers from rural to urban work. How do we gauge the net increase in the community's real product? Surely, by taking the product of the industrial workers, less the rural product foregone in respect of those taken away from rural work; but also less the cost of transporting and distributing food to those former farm families, who used to supply themselves without any such costs being incurred. For the incurring of such costs is a necessary consequence of the transfer of rural populations to industrial employment, and any rise in such costs is

therefore quite fairly debited against the increased product of the industrial community. To carry out directly such a process of debiting would not be statistically convenient; but we get the same result, in effect, by *crediting* to rural



communities an imputed income for the costs which would be incurred in transporting and distributing the goods which they at present consume on their own farms.

This argument cannot be carried too far, or it will lead to fantastic results. In the very poorest agrarian communities, imputed income rises to an improbably large proportion of the whole. But in all the communities for

which we propose to use the I.U. rather than the O.U. method of measurement — that is to say, approximately, down to a real income level of about 100 I.U. per head — the proportions involved are small.

A detailed calculation for every country is not practicable and would be immensely laborious even if it were. As the amounts involved are in most countries only of the order of magnitude of a few per cent of national income, a simplified method can be used. The percentage by which national income must be increased to take account of the imputation of retail rather than wholesale values of home-consumed farm products is found to be a function, as might have been expected, of the proportion which agricultural employment bears to the total labour force (see Table I, page 76, and diagram on page 77).

A double logarithmic relationship appears to fit the data, subject to the provision that two separate lines are drawn for the Old World and (on United States data) for the New World. It is reasonable to expect that, at a given level of real income, New World farmers are likely to be relatively more concerned with farm products for commercial sale, less with products for family consumption. (In Canada, with specialisation on wheat farming, the proportion of family consumption is still lower : the U.S.A. figures are used to give a trend : see diagram, page 77.)

SOURCES OF DATA

Canada.—Hope, *Canadian Journal of Economics and Political Science, 1943.*

France.—M. Dugé de Bernonville gives the net output of agriculture at 42 milliard francs, say 50 milliard francs gross output, in 1932. For this year we have a number of studies of distributive costs of farm produce (*La Répartition des denrées alimentaires*, Conseil National Économique, 1933, quoted in International Institute of Agriculture, *Investigations into the Margin between Producers' and Consumers' Prices of Certain Foodstuffs*, Rome, 1937).

From this information the following table can be constructed:

TABLE II

	Output, million quintals	Farm Value of Output, milliard francs	Retail Value, milliard francs
Wheat and bread . .	91·0	10·6	18·1
Vegetables	..	9·8	20·0
Eggs	3·4	3·7	5·0
Poultry	2·5	1·2	2·3
Milk	112·0	9·1	17·8
Meat	17·3	9·9	19·5
Other	..	5·7	(10·7)
TOTAL . .	..	50·0	93·4

The value of the distributive work attributable to the entire output was thus 43·4 milliard francs in 1932, and probably about the same in 1929 (wages and other urban costs were much the same in 1929 and 1932). We can therefore apply the 1929 purchasing power of the franc (0·0495 I.U.) to this amount, equating it to 2·15 milliard I.U.

Germany.—Data from *Konjunkturstatistisches Handbuch* are available for the period 1925–33 and indicate that, after allowing for price changes, there was no significant change in the real volume of *Eigenverbrauch* over this period (see Table III, page 80).

The latter column total corresponds to 5·98 milliard reichsmarks in 1929 after adjustment by the index of retail food prices, the goods in question having been included in national income at their wholesale value of 3·58 milliard reichsmarks. The amount to be added to national income in 1929 is therefore 2·40 milliard reichsmarks or 0·58 milliard I.U.

TABLE III

RETAIL VALUATION OF HOME-PRODUCED FOOD CONSUMED BY FARM FAMILIES (*Eigenverbrauch*)

	Eigenverbrauch 1930–31, milliard reichsmarks (from *Konjunkturstatistisches Handbuch*, p. 188)	Percentage Addition for Processing and Distribution Costs including Consumption Taxes (International Institute of Agriculture, *Investigations into the Margin between Producers' and Consumers' Prices of Certain Foodstuffs*)	Retail Value, million reichsmarks
Rye	295	112	625
Wheat	203	159	526
Potatoes	130	98	257
Sugar	134	245	462
Vegetables	70	116	151
Fruits	279	77	494
Beef	141	51	213
Pig-meat	649	30	844
Veal	25	40	35
Mutton and lamb	28	58	44
Poultry	75	78	134
Eggs	155	74	269
Milk and milk products	717	52	1090
Barley and oats	12	100 *	24
Goats' meat	26	50 *	39
Other products	22	75 *	38
	2961	..	5245

* Assumed.

Ireland.—From *National Income and Expenditure, 1938–44.*

Italy.—Precise results for 1938 and 1947–49 are given in *Annali di Statistica*, Serie VIII, vol. iii, *Studi sul reddito nazionale.*

In 1938, according to the source above, the gross production of saleable[1] farm products was 42·94 milliard lire.

[1] Not necessarily sold; this includes produce used for food or fodder on the farm.

		Md. Lire
Farm produce		42·94
Fisheries		1·77
		44·71
Deduct :		
Industrial crops other than sugar beet	0·98	
Timber produced on farms	0·59	
Wool	0·26	
Seeds and fodder	1·56	
		3·39
		41·32
Imports of food		1·84
		43·16
Deduct exports of food 3·39, value at farm probably		2·50
		40·7
Net value added by food manufacture		7·6
Indirect taxation on food		1·5
Value of food available at wholesale		49·8

The technique for estimating imputed income, in Italy's case, is to deduce, by comparison of wholesale and retail prices, how much might have been expected to be spent on the transport and distribution of foodstuffs. We then ascertain how much expenditure was actually incurred by retailers, wholesalers and others in the food trade; the difference represents imputed income. From a comparison of wholesale and retail prices (see Table IV, page 82), the expected value added by transport and distribution is 40·7 per cent of the wholesale value of foodstuffs, or 20·3 milliard lire on 49·8 milliard wholesale value. The cash costs of distribution were only 6·4 milliard lire and the balance of 13·9 milliard lire at 1938 prices (14·2 milliard at 1929 prices) represents the imputed value of distributive services on foodstuffs grown by peasant families for their own consumption or for sale or exchange to their near neighbours.

TABLE IV

Foodstuffs for which Difference between Wholesale and Retail Price can be Traced, 1938

	Average Farm Value, lire per quintal	Value of Farm Production, million lire	Value of Farm Production + Imports – Exports	Average Retail Price, lire per kg.	Computed Value added by Transport and Distribution, million lire
Wheat flour [a]	213·0 [b]	..	11,090 [c]	3·25 [d]	5,830
Maize flour [a]	102·0 [e]	..	1,050 [e]	1·24	226
Rice . .	96·5	758	555	1·27 [f]	175
Potatoes .	49·5	869	797	0·57	120
Sugar . .	638·0 [g]	569 [h]	579	6·64	24
Olive oil .	744·0	1030	1,040	8·45 [i]	141
Beef and veal (live weight)	376·0	2585	2,685	5·31 [k]	1,089
Pigmeat (live weight) .	526·0	2645	2,640	7·90 [l]	1,322
Milk . .	79·0	1100 [n]	1,100	1·17 [m]	530
Butter .	1197·0	788 [o]	790	14·59	172
Cheese .	861·0	2770 [p]	2,586	13·58	1,498
Eggs . .	465·0 [q]	2942	2,979	0·505 [r]	256
	..	..	27,891	..	11,383

[a] Assumed 70 per cent extraction rate. Bread or "pasta" assumed to be equal in weight to the original wheat.
[b] Mean of wholesale price of flour, tipo 1, Milan and Naples and of "pasta", 1st quality, Naples.
[c] Calculation based on an estimated supply of flour available for distribution of 52 million quintals wheat flour and 10·3 million quintals maize flour.
[d] Mean of bread and "pasta" prices 2·27 lire per kg., equivalent to 3·25 lire per kg. flour.
[e] Wholesale price, Milan.
[f] 1·96 for polished rice equivalent to 1·27 lire per kg. rough rice.
[g] Wholesale price, Bologna. [h] Refinery production. [i] Lire = 0·91 kg.
[k] 9·67 lire per kg. of meat equivalent to 5·31 lire per kg. live weight.
[l] 11·28 lire per kg. meat equivalent to 7·9 lire per kg. live weight.
[m] Litre = 1·03 kg.
[n] After deducting 1600 million lire worth of milk taken by butter and cheese factories.
[o] Of which 325 million lire farm butter, the rest factory butter.
[p] Of which 1299 million lire farm cheese, rest factory cheese.
[q] Per thousand. [r] Each.

TABLE V

Cash Expenditure on Food Distribution
Md. Lire 1938

Income of food retailers	3·94
Share of income of wholesalers attributed to transactions in food	1·3
Railway freights on food	0·65
Other goods and services used by wholesalers and retailers in their businesses	0·65
	6·54

In comparing wholesale and retail prices we can get sufficiently precise information about commodities comprising rather more than half the total; these are assumed to give a representative result.

Japan.—For 1934 the estimate of national income by the Japan Economic Federation, in which all unsold products consumed by farm families are valued at wholesale price, was 13·04 billion yen at factor cost, or 14·16 billion yen at market prices. Of this, 10·7 billions was urban income, of which about 8·4 billions was consumed, and the remainder saved. Family budget studies show that, out of urban consumption, about 34 per cent or 2·85 billions represented food. Comparison of wholesale and retail prices indicates that the value of this output on farm would have been 1·5 billions. This leaves, out of total farm and fishery output, 1·4 billions, at wholesale prices, to be consumed direct by farm and fishing families. (It may be objected that, in the first place, the ratio of value on farm to retail value is remarkably low; secondly, that the ratio of unsold to total product is remarkably high; but both these results are to be expected in a year of exceptionally low prices such as 1934.) The farm family consumption which had a wholesale value of 1·4 billions would have had a retail value of about 2·65 billions.

Turkey.—The data on page 84 on rural consumption are from Sefik Bilkur, *National Income of Turkey*, p. 45.

Recording at current wholesale prices in Turkish pounds, this food for farm family consumption, valued at £T302 millions, was in 1935–36 no less than 69½ per cent of total agricultural output for that year. If we take 69½ per cent of agricultural output valued in I.U., this gives us 359 million I.U. also, as compared with a retail value of 513 million I.U. The amount to be added for imputation is thus 154 million I.U., while the remainder of national income in 1935–36 was 939 million I.U.

TABLE VI

	Consumption per Adult, kilos per year	Wholesale Value, £T 1935–36	Retail Value, £T 1938	Retail Value, I.U.
Wheat and barley	300	15·0	27·0	24·1 *
Rice	2	0·3	0·4	0·4
Potatoes	3·5	0·1	0·2	0·2
Meat	5	0·8	2·0	3·3
Oils and fats	4	0·6	2·4	1·4
Milk	55	1·9	5·0	7·3
Butter	0·8	0·6	0·8	0·8
Cheese	0·4	0·1	0·1	0·3
Eggs	2	0·3	1·0	1·2
Pulses	6	0·4	0·6	1·3
Onions	3	0·1	0·2	0·3
Fruit and vegetables	80	8·5	(12)	8·0
TOTAL	..	28·7	1·75	48·6
do. per head	..	24·4	..	41·4
Aggregate for whole rural population (millions)	..	302	..	513

* As flour.

United States.—The United States Department of Agriculture in the annual *Agricultural Statistics* gives estimates of the dollar value (wholesale) of home consumption, and also, in the table "Price Spreads", data from which we can calculate the average distribution costs incurred per dollar of farm value of a representative collection of foodstuffs. These data are used to extend the survey to cover two other years, 1913 and 1950. In 1913 the dollar value of home consumption was 13 per cent below that of 1935, in 1950 77 per cent higher. Distribution costs, per dollar value at farm, were 29 per cent below the 1935 level in 1913 and 32 per cent lower in 1950. (In a year of low wholesale prices, like 1935, distribution costs per dollar of value on farm are always relatively high.) Multiplying these two factors together, we conclude that the amount to be imputed compared

with 1·72 billion dollars in 1935 was 1·06 billion dollars in 1913 and 2·09 billion dollars in 1950.

TABLE VII

IMPUTED RETAIL VALUE OF HOME-GROWN FOOD CONSUMED ON FARMS

(1935, $ million)

	Official Estimates of Wholesale Value of Goods consumed on Farm	Amount to be added to express at * Retail Values
Corn	24	23
Wheat	14	68
Potatoes	49	68
Sweet potatoes	32	75
Truck and garden crops	200	540
Apples	21	43
Other fruit and nuts	19	76
Syrup	8	17
Beef and veal	22	27
Pork	206	143
Mutton and lamb	3	2
Poultry	107	81
Eggs	144	74
Milk	389	475
	1238	1712
Other foods	6	(8)
TOTAL	1244	1720

* From ratios given in *Price Spreads between the Farmer and the Consumer*, R. O. Bean and F. V. Waugh, U.S. Department of Agriculture, Division of Marketing Research, 1936.

It is now possible to give, by a standardised sort of treatment, calculations of real income and real product for all the available years for all the countries for which the I.U. rather than the O.U. method of measurement is appropriate.

As we now propose to define them, real income differs from real product in two respects. A country with a given level of real product may have a higher or a lower

real income in so far as real product is augmented, or reduced, by investment income receivable from or payable to other countries. A country with a given level of real product may also find its real income augmented if the terms of trade turn in its favour so that it receives a larger volume of imports for a given number of exports; and conversely.

The most convenient procedure is first to calculate real income, which is done simply by taking national income at market prices, multiplying by the figure showing the current purchasing power in I.U. of one unit of national currency, and then making an allowance for imputation (of retail prices for unsold farm products).

While we may wish to study real product per man-hour of work done, we are also interested in real income as a determinant of consumption and saving, and in this case it is most expedient to measure it per head of population, whether working or not, and irrespective of the length of the working week.

Let M represent national income at market prices in national currency, including an allowance for imputation,[1] V (which may be negative) net investment income received from abroad, E and I exports and imports in national currency, E′ and I′ exports and imports measured in I.U. Let p represent purchasing power, in I.U., of one unit of national currency.

Then real national income will be Mp.

The supply of goods and services for consumption or investment within the country will be $M+I-E$, or $M+I-E-V$ if we are considering the supply of such goods obtained directly, or by internal exchange, from the current efforts of the country. The total net national product, in real terms, will therefore be $p(M+I-E-V)+E'-I'$.

As we have already calculated pM as real national income, our procedure is to deduct from it $p(E-I+V)$, then add $E'-I'$ to obtain real national product.

[1] In fact, the allowance for imputation is not made at this stage, but later, after income has been expressed in I.U. But for clarity of algebraical exposition it is preferable to assume that this allowance has already been made.

We next ascertain "labour force", which for most countries is only known for census years; but as the ratio between labour force and total population does not change rapidly, interpolation is fairly safe. In computing labour force different countries have very different procedures about members of farm families and other women working in agriculture — in some countries every farmer's wife is automatically recorded as an agricultural worker — and for this reason the only satisfactory procedure is to exclude so-called women agriculturists from the labour force throughout. We next have to deduct unemployment, on which not many countries have satisfactory information. For the early years many almost arbitrary figures have to be adopted; but these were years in which unemployment was fairly low; in places and times for which it has been high some effort has generally been made to estimate it.

Working hours are generally recorded only for industrial workers, and then as average number of hours per week. There are virtually no statistics of the average number of weeks worked per year. In most countries there is some provision for holidays apart from sickness and other similar causes of absenteeism. For convenience, where direct information of hours per year is not available, weekly hours are multiplied by fifty.

Further details are given in the notes at the foot of the tables for individual countries. The countries are arranged in alphabetical order.

[Tables and Notes, pp. 88–200.

	1951	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1916
Income at factor cost	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Income at market price [a]	65·7	27·84	23·13	17·55	13·17	12·38	11·07	10·24	9·01	8·11	7·93	7·61	..	..	..	5·21
I.U. per unit national currency	0·0943	0·212	0·241	0·271	0·3215	0·349	0·368	0·396	0·441	0·443	0·449	0·440	0·440	0·450	0·490	0·434
Real income, I.U. million	6200	5900	5575	4750	4230	4320	4080	4055	3970	3590	3560	3335	..	..	..	2260
Real income, including imputation	6398	6089	5754	4900	4361	4452	4202	4175	4085	3693	3660	3427	3371	3085	2751	2298
Real income per head population	363	373	361	313	284	294	282	285	284	261	262	250	241	224	203	280
Export surplus	−3·78	−0·65	0·16	1·64	1·34	1·35	1·25	0·51	0·19	−0·07	0·23	−0·06	0·75	0·54	0·39	..
Net external income	(0·00) [b]	−0·06	−0·27	−0·45	−0·38	−0·48	−0·37	−0·48	−0·40	−0·37	−0·43	−0·37	−0·61	−0·55	−0·54	−0·21
Sum of above in I.U. million	−357	−150	−27	322	308	304	324	12	−92	−195	−90	−189	61	−4	−73	..
Exports, I.U. million [c]	502	..	475	499	432	447	408	414	494	594	751	575	901	726	850	..
Imports, I.U. million [c]	786	..	764	405	176	153	237	298	298	450	427	489	519	405	389	..
Real product, I.U. million	6471	(5939)	5492	4672	4309	4133	4344	4373	4032	4032	4074	3702	3692 [d]	3410 [d]	3285 [d]	(2390)
Labour force, million [e]	6·89	6·37	6·20	6·11	6·00	5·91	5·81	5·71	5·62	5·53	5·44	5·36	5·26	5·17	5·08	3·25
Numbers in work, million [f]	6·82	6·31	6·14	6·05	5·94	5·85	5·75	5·60	5·46	5·31	5·17	5·09	5·00	4·91	4·83	3·19
Real product per man-year	936	942	895	773	726	760	718	775	807	759	788	728	738	695	680	749
Hours per year [g]	2120	2140	2188	2200	2334	2317	2315	2252	2252	2262	2225	~~2275~~	2275	2275	2275	2500
Real product per man-hour	0·441	0·439	0·408	0·351	0·311	0·328	0·310	0·344	0·356	0·336	0·354	0·320	0·324	0·305	0·299	0·300

NOTES FOR TABLE VIII

[a] Gross product at market prices, less 10 per cent for depreciation, and interest and dividends payable abroad. Data from U.N. (1916 from Bunge).

[b] Assumed.

[c] Computed by volume indexes from base in 1938, in which year it was assumed that one U.S. dollar's worth of imports was 1·103 I.U. (from U.S. prices), of exports 1·315 I.U. (this latter figure obtained by comparing Argentine export prices with their 1925–34 average, pesos being converted into dollars throughout). For 1951 it was assumed that one U.S. dollar had a purchasing power of 0·564 I.U. for both imports and exports. The official series of volume indexes ends in 1947.

[d] Extrapolated back from 1938 by Central Bank estimates of real product.

[e] Ratio of labour force to total population known only for 1914 and 1947, interpolated for other years. Excludes women in agriculture.

[f] No data on unemployment — assumed throughout.

[g] From I.L.O. *Year-Book of Labour Statistics* (assumed for 1916): weekly hours multiplied by 50. I.L.O. index number published in 1949–50 *Year-Book* linked to old series on mean of years 1943–45: index published in 1951–52 *Year Book* link on mean of years 1946–49.

TABLE IX

AUSTRALIA (millions of Australian £)

(Years ending 30th June from 1913–14 onwards)

	1952–53	1951–52	1950–51	1949–50	1948–49	1947–48	1946–47	1945–46
Income at factor cost [a]	3579	3050	2976	2181	1769	1601	1287	1219
Income at market price [a]	3979	3464	3271	2440	1988	1773	1459	1353
I.U. per unit national currency [b]	1·46	1·59	1·92	2·22	2·51	2·81	3·04	3·20
Real income, I.U. million	5815	5489	6259	5417	4990	4982	4435	4330
Real income, including imputation	5900	5571	6353	5504	5075	5072	4515	4412
Real income per head population	675	652	765	681	649	664	600	594
Export surplus [c]	351	−364	246	67	116	68	66	47
Net external income	−58	−58	−57	−51	−40	−42	−41	−39
Sum of above in I.U. million	428	−671	363	36	191	73	76	26
Exports, I.U. million [c]	750	600	670	721	730	655	626	645
Imports, I.U. million [c]	711	1320	1052	919	768	627	575	445
Real product, I.U. million	5511	5522	5608	5270	4846	5027	4490	4586
Labour force, '000 [e]	3665	3565	3465	3365	3265	3175	3142	2881
Numbers in work, '000 [f]	3366	3450	3407	3303	3226	3135	3057	2816
Real product per man-year	1638	1603	1650	1596	1502	1604	1469	1629
Hours per year	2000	2000	2000	2000	2000	2100	2212	2230
Real product per man-hour	0·819	0·801	0·825	0·798	0·751	0·764	0·664	0·730

	1931–32	1930–31	1929–30	1928–29	1927–28	1926–27	1925–26	1924–25
Income at factor cost [a]	470	529	694	729	711	698	660	648
Income at market price [a]	523	580	755	790	771	760	716	701
I.U. per unit national currency [b]	4·53	4·20	3·86	3·85	3·85	3·81	3·76	3·82
Real income, I.U. million	2370	2437	2914	3042	2969	2895	2692	2678
Real income, including imputation	2440	2506	2994	3123	3048	2973	2765	2751
Real income per head population	372	386	465	492	488	486	461	468
Export surplus [c]	51	31	−19	10	7	−15	6	30
Net external income	−37	−44	−38	−36	−36	−33	−32	−29
Sum of above in I.U. million	63	−55	−220	−100	−112	−183	−98	4
Exports, I.U. million [c]	707	665	472	530	512	523	544	478
Imports, I.U. million [c]	268	333	580	602	582	652	582	506
Real product, I.U. million	2746	2893	3106	3151	3090	3027	2825	2719
Labour force, '000 [e]	2620	2625	2624	2617	2578	2512	2445	2380
Numbers in work, '000 [f]	2041	2147	2351	2438	2418	2413	2327	2246
Real product per man-year	1345	1347	1321	1292	1278	1254	1214	1211
Hours per year	2159	2181	2158	2156	2164	2164	2212	2217
Real product per man-hour	0·623	0·618	0·612	0·599	0·591	0·579	0·549	0·546

1944–45	1943–44	1942–43	1941–42	1940–41	1939–40	1938–39	1937–38	1936–37	1935–36	1934–35	1933–34	1932–33
..	..	..	..	..	..	750	730	695	618	574	550	493
..	..	..	..	..	..	840	799	759	682	633	609	551
..	..	..	..	..	..	4·22	4·19	4·33	4·43	4·57	4·68	4·67
..	..	..	..	..	..	3545	3348	3286	3021	2893	2851	2573
..	..	..	..	..	..	3632	3433	3373	3104	2975	2935	2651
..	..	..	..	..	..	524	500	495	460	444	441	401
..	..	..	..	..	..	27	27	56	38	28	53	40
..	..	..	..	..	..	–40	–38	–36	–35	–35	–36	–37
..	..	..	..	..	..	–55	–46	87	13	–32	80	14
..	..	..	..	..	..	796	662	607	623	656	557	660
..	..	..	..	..	..	596	639	567	541	474	387	361
3870[d]	3617[d]	3595[d]	3902[d]	3838[d]	3931[d]	3887	3410	3326	3173	3189	3025	2936
2647	2601	2579	2721	2876	3010	3006	2912	2830	2738	2679	2630	2616
2612	2575	2545	2661	2748	2767	2747	2698	2587	2431	2280	2129	2053
1482	1405	1413	1466	1397	1421	1415	1264	1286	1305	1399	1421	1430
2240	2271	2272	2219	2136	2096	2120	2129	2134	2140	2148	2148	2153
0·662	0·619	0·622	0·661	0·654	0·678	0·667	0·594	0·603	0·610	0·651	0·662	0·664

1923–24	1922–23	1921–22	1920–21	1919–20	1918–19	1917–18	1916–17	1915–16	1914–15	1913–14	1901–3[e]	1891[e] (N.S.W. only)
599	558	514	522	534	336	317	339	339	298	309	171	62·1
649	604	554	566	566	363	339	363	364	320	332	184	65·6
3·73	3·75	3·39	2·96	3·11	3·51	3·82	4·48	4·95	5·63	5·91	7·18	6·70
2421	2265	1878	1675	1760	1274	1295	1626	1802	1801	1963	1322	439·5
2488	2328	1930	1722	1810	1311	1332	1674	1855	1855	2022	1364	454·4
432	413	350	318	342	257	267	339	373	373	414	355	405
–8	–1	34	–17	60	25	25	24	2	8	10	9	..
–29	–26	–26	–24	–23	–22	–23	–19	–18	–17	–16	–14	–5·0
–138	–101	27	–121	115	11	8	22	–79	–51	–35	–36	..
397	474	603	477	546	451	322	390	367	404	510	290	..
476	553	357	471	504	288	211	332	438	441	553	320	..
2547	2350	2149	1849	1737	1463	1435	1710	1863	1869	1955	1370	487·9
2316	2253	2187	2139	2056	1762	1732	1761	1830	1912	1915	1612	..
2207	2139	2031	1998	1980	1685	1658	1686	1750	1763	1849	1584	446
1154	1099	1058	925	877	868	866	1014	1065	1061	1057	865	1094
2227	2214	2204	2247	2290	2304	2317	2332	2344	2355	2365	2428	2440
0·518	0·496	0·480	0·412	0·383	0·377	0·374	0·435	0·454	0·451	0·447	0·356	0·448

[*Notes for Table IX on following 6 pages*

NOTES FOR TABLE IX

[a] From 1945–46, White Paper published annually in Canberra adjusted as below. 1901–3 to 1938–39 from Clark and Crawford, *The National Income of Australia* (Sydney, 1938), adjusted slightly later in *Economic News* (Brisbane) October-December 1946. The figures given in the table have been adjusted from original data as follows :

To eliminate inventory revaluation gains and losses £ million :

1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	1934–35	1935–36	1936–37	1937–38
−3	+6	+23	+2	+5	+2	−2	−9	−9	−7

1938–39	1945–46	1946–47	1947–48	1948–49	1949–50	1950–51	1951–52	1952–53
+4	−1	−7	−67	−76	−65	−150	−200	—

To make provision for depreciation at replacement cost throughout, in place of depreciation allowances based on original cost for private businesses, and expenditure actually incurred in public enterprises :

1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	1934–35	1935–36	1936–37	1937–38
0	−4	−14	−23	−25	−25	−26	−24	−20	−21

1938–39	1945–46	1946–47	1947–48	1948–49	1949–50	1950–51	1951–52	1952–53
−17	−73	−71	−84	−93	−47	—	—	—

After the inquiries of 1901–3, there was a gap until 1914–15, in which year the Commonwealth Statistician was empowered to conduct an official " War Census ", which gave a figure of £256 millions for the incomes of all Australia. It is believed, however, that this figure was a considerable understatement, partly through deliberate mis-statement through fear of taxation, partly through deduction of abnormal drought losses. Benham was inclined to put the figure in the neighbourhood of £315 millions, but did not feel able to agree to the very high figure of £347 millions suggested by Professor J. B. Brigden.

J. T. Sutcliffe's calculation of Australian national income, under the title of *The National Dividend,* was published in 1926. When this book was published, current national income figures were available in only a few countries, and were generally of an extremely approximate nature. Sutcliffe's work, therefore, made Australia one of the pioneer countries in this field, with little outside experience to go upon and a new technique to be discovered. In 1916–17 was introduced a Federal Income Tax applying uniformly throughout Australia, which made it possible to apply an " incomes received " method. Sutcliffe began his series in that year and obtained results as follows :

	£ millions	
1916–17	348	To which some £10 millions a year must be added for the income from owner-occupied houses.
1917–18	370	
1918–19	388	
1919–20	536	
1920–21	529	

The figure for 1920–21 is confirmed almost exactly by a calculation by the production method. Official statistics were available for rural, mineral and manufacturing production ; estimates of other production being made from data from

the Census of April 1921, and other sources. For other years so-called production figures are obtained by adding a fixed percentage to recorded production, and cannot be taken as original data.

In effect, Sutcliffe showed that by adding to the gross value of recorded production a certain proportion representing unrecorded production, it was possible to obtain an approximation to the value of net national income, which, when checked against the alternative information from taxation and wage statistics for the years for which such comparisons were possible — namely, 1916–17 to 1921–1922 — was found to be fairly reliable. This formula was used by him to estimate income up to the year 1924–25. Without detracting from Sutcliffe's achievement, which was remarkable, it is unfortunate that overmuch reliance has been placed on his method.

The only subsequent direct investigation into national income during this period was a calculation determined by the taxation method made by Dr. F. C. Benham,[1] relating to 1924–25. Some £10 millions should be added to his result for State taxation payments claimed as a deduction for Federal tax returns, a point which Dr. Benham omitted.

An interpolation between 1921–22 and 1928–29 can be most conveniently made from the production statistics. Instead of applying a fixed percentage addition to the gross income from primary and secondary production (the so-called Sutcliffe method), it is preferable to calculate the net income produced by rural, mineral and manufacturing production, and to make a direct computation of the incomes from other production on the basis of changes in the number of persons occupied in those industries. An almost linear increase in the productivity per head in such industries was obtained for this period.

[b] Changes in inventories were treated separately from other forms of Private Investment. After allowance was made for changes in the book values of stocks, " Inventory " investment (or dis-investment) was expressed in 1925–34 prices by the use of a wholesale Price Index (Commonwealth Statistician's Index of Basic Materials and Foodstuffs, *Quarterly Summary of Australian Statistics*, since September 1937, and prior to that date linked to Wholesale Price Index, *New South Wales Statistical Bulletin*).

The remaining portion of Investment was revalued by means of a composite index of investment goods (other than inventory investment). Equal weighting was applied to an index of the cost of construction of a standard dwelling compiled by the Bureau of Industry and of an export price index of articles wholly or mainly manufactured in the United Kingdom (adjusted for changes in exchange rates in 1929–31).

These articles comprise Class III, Items C-G inclusive of the Board of Trade classifications of External Trade. Such items included:

C. Iron and steel and manufactures thereof;
D. Non-ferrous metals and manufactures thereof;
E. Cutlery, hardware, implements and instruments;
F. Electrical goods and apparatus;
G. Machinery.

The index was compiled from the recorded values and the volume index of these items presented in the *Monthly Digest of Statistics*, issued by the Central Statistical Office, London, and the *Board of Trade Journal* prior to January 1946.

The remaining component requiring revaluation in real terms, Consumption, cannot be adequately deflated by the " C " Series All Items index, particularly during the post-war years. Consumption contains two major items which are not truly represented by this index. Firstly, such consumers' durables as motor vehicles (for private use) cannot be deflated by the " C " Series index, and

[1] *The Prosperity of Australia*, 1928.

secondly, for that portion of consumption represented by Gross Rentals of Dwellings, we cannot accept the relatively stable rental figure in the "C" Series index as representative of average rentals. This index is based upon the housing (four and five rooms) index of thirty towns, the rentals of which have been fixed by Regulations since 1942 on values ruling at that date.

With regard to motor vehicles for private use which are included in the White Papers under Gross Private Investment, there is no actual breakdown of new registrations of motor vehicles each year into those for commercial and private use. However, for 1947–48 a *Survey of Motor Vehicles* was published by the Commonwealth Statistician which did distinguish between "Private" and "Business or Part Business". This distinction provided a basis on which it was possible to separate out from new registrations of each year those vehicles which were exclusively for private use. The prices of these were determined from Dr. Roland Wilson's *Public and Private Investment in Australia* for the period 1928–29 to 1937–38. Post-war prices were obtained from the official journal of the Federal Chamber of Automotive Industries, *Automotive Industry*, the statistics of which are by courtesy of J. S. Strong, Esq., Australian Representative, Society of Motor Manufacturers and Traders Ltd.

Real values were obtained by the application of the number of new registrations to the real value of a standard or average motor car and commercial vehicle.

Provision was made for the improvement in the post-war "standard".

The following table shows the estimated money expenditure (£ million), and real expenditure in million I.U., on private motor cars. I.U. values were obtained by comparing car prices in Australia and United States during 1925–34. (U.S. prices from *Automobile Facts and Figures*.)

For revaluing the gross rental of dwellings the link is made on the basis of an international comparison of rents in 1936, see *Review of Economic Progress*, vol. i, No. 1. The I.U. value of rental for other years was estimated from this basis from figures of the increasing number of houses with a small allowance for change in quality.

MONEY AND REAL VALUE OF EXPENDITURE ON RENT AND CARS

Year	Money Expenditure, £ million		Real Expenditure, I.U. million	
	Rent	Cars	Rent	Cars
1928–29	82	14	313	33
1929–30	83	10	315	23
1930–31	76	3	316	7
1931–32	67	2	320	4
1932–33	65	3	325	6
1933–34	68	5	339	10
1934–35	71	8	345	16
1935–36	76	12	354	24
1936–37	82	12	367	24
1937–38	87	13	377	27
1938–39	92	12	387	24
1945–46	106	. .	436	1
1946–47	108	9	444	11
1947–48	111	19	456	21
1948–49	115	30	471	32
1949–50	119	56	486	54

Having dealt with cars and rents, the remainder of consumption was converted to real values by the use of the "C" Series Retail Price index excluding rent, and consumption was then converted to I.U. by the factor 3·92 for the I.U. equivalent of the Australian £ in 1929, or 3·97 for 1928–29.

[c] Gold production, whether exported or not, included with exports. Imports reckoned f.o.b. I.U. values of imports and exports based directly on average of 1925–34.

[d] Approximate evaluation, applying best available price index numbers to private and governmental outlay, and allowing for the fact that the official index number considerably understated the real rise in prices during the war years.

[e] During both war periods pay and allowances to the Forces are omitted from national income, and the numbers of men in the Forces from the numbers in work. In the First World War this question solved itself (within the limits of the precision of the figures then available) through the fact that the great majority of Service men were outside Australia. The numbers of men and the amounts of pay involved were as shown in the table following.

PAY AND ALLOWANCES OF ARMED FORCES

Year	'000 Numbers in Forces	£ million Pay and Allowances of Forces
World War I:		
1914–15	37	..
1915–16	151	..
1916–17	252	..
1917–18	310	..
1918–19	310	..
1919–20	50	..
World War II:		
1939–40	64	13
1940–41	256	56
1941–42	482	114
1942–43	695	181
1943–44	721	195
1944–45	673	189
1945–46	394	154

[f] For recent years, unemployment is estimated by Commonwealth Statistician. For earlier years, Trade Union unemployment rate assumed applicable to two-thirds of the labour force.

[g] The story of the earliest estimate of Australian national income (see Professor Butlin, *Economic Record*, December 1938) involves the colourful figure of W. C. Wentworth, one of the first white men born in the Antipodes, explorer, poet, petitioner for Parliamentary Government, and first Premier of New South Wales. He once owned the South Island of New Zealand as a private estate. Amongst his other activities, Wentworth prepared an estimate of Australian national income for 1821, at a time when the population was 35,000, "surprisingly good" and "distinctly modern" in Professor Butlin's words. His figures indicate an average money income of £17 per head of the population of New South Wales (which comprehended the whole Australian mainland at that date) and a much higher figure of £32 per head of population in the newly formed colony of Van Diemen's Land, or Tasmania. The over-all average was £20 per head.

Professor Butlin indicates that the only serious omissions were Government Services, convict labour on public works and increases in capital equipment. The last-named were mainly provided by capital inflow and should not therefore be included in estimate of produced national income. An allowance perhaps as high as 30 per cent should be made for these omissions. Prices, according to Coghlan, were about 50 per cent higher than in the 1890s. An income of £17 per head in New South Wales in 1821 could therefore be considered as equivalent to £11·3 at prices of the 1890s, as against an average income per person of about £56 in the 1890s.

In *Wealth and Progress of New South Wales*, T. A. Coghlan (later Sir Timothy) made an estimate of real wages back to 1821. His estimate was revised by G. H. Wood, *Journal of the Royal Statistical Society*, 1901, pp. 327, 672.

These figures do not conflict with Wentworth's estimate. They presumably refer to the wages of free labour, whereas the figure of real income per head is affected by the proportion, large at that date but subsequently rapidly falling, of convicts who received little or no wages. The extraordinary movements in the 1850s are a consequence of the discovery of gold in Victoria in 1851. This discovery drained practically all the rural labour away from New South Wales and greatly increased both money and real wages of those who remained. With the great increase in population, livestock, which had previously been valuable only for their wool, hides and tallow, now became saleable as meat.

REAL WAGES IN NEW SOUTH WALES
(1838–1898 base)

	Coghlan's * Estimate	Wood Revised
1821–37	52	38
1838–42	59	40
1843–52	57	50
1853–58	97 †	79
1859–62	74	66
1863–72	89	84
1873–92	103 ‡	99
1893–98	100	100

* An earlier estimate which Coghlan published in *Wealth and Progress of New South Wales* gives real wages, on an 1871–89 base, as follows: Before 1836, 60; 1836–43, 65; 1843–51, 53; 1851–57, 83; 1857–71, 82.

† The following figures of wages and prices in Victoria are given by Rae, *Economic Journal*, 1891, p. 29:

	Wages per Day	Cost of Artisan's Subsistence per Week
1854	£1 10s. 0d.	£7 0s. 3d.
1857	15 0	3 13 4
1861	12 0	2 7 4

‡ Jeans (*Journal of the Royal Statistical Society*, 1884) finds that Australian wages at that date averaged about 4 per cent below those of U.S.

No further work appears to have been done till the series of studies made by Coghlan for various years between 1886 and 1903. Except for his 1901–3 calculations his investigations are confined to New South Wales, which State contained in that time about 34 per cent of the population of Australia. There is independent evidence to show that, unlike the U.S.A., there was considerable homogeneity in

Australian economic development, and per head figures based on New South Wales will give a fairly close indication of the Australian total.

Coghlan's estimate for 1891 has recently been subjected to a very careful analysis by Professor Arndt and Mr. N. G. Butlin (*Economic Record*, June 1950). Re-stating his items in accordance with present-day definitions and terminology, the authors find a net national output at factor cost of £67·1 millions, of which £5·0 millions represented net interest and dividend payments due abroad. Coghlan's figure as originally published for 1891 was £66·4 millions. To convert this figure to market prices we must add £3·5 millions of indirect taxation.

Coghlan's first calculation of national income was published in his book *The Wealth and Progress of New South Wales, 1886–87*. In the 1889–90 edition of the same volume, the estimate was revised and brought up to date. Detailed workings are not given, but statistical information at that date was available on a considerable scale, and it was the "net output" method which Coghlan used for all the principal branches of production.

He made further calculations for 1891, 1898 and 1901 which were quoted in current issues of the New South Wales *Year Book* and in this last year made the first calculations for all Australia and for New Zealand. These calculations were repeated for 1902 and 1903 in the issue for each year of *The Seven Colonies of Australasia*, but then ceased.

The estimates Coghlan made for the year 1901, 1902 and 1903 for the national income of the whole of Australia were carefully examined by Dr. F. C. Benham,[1] who made some slight adjustments to bring them into line with modern definitions. He gave an average for those three years of £185 millions for income produced. Interest and dividend payments overseas averaged £13,700,000 for these three years, leaving £171,300,000 available income.

The New South Wales *Year Book* gives some further figures up to 1925–26. These can be compared with the figures calculated below for the whole of Australia.

[1] *The Prosperity of Australia*, 1928.

TABLE X

Austria (billion schillings)

	1952	1951	1950	1949	1948	1947	1946	1937	1936	1935	1934	1933
Income at factor cost [a]	..	50·2	37·1	29·20	22·53	18·22	..	7·00	6·88	6·36	6·71	6·65
Income at market price	..	57·3	40·1	32·8	25·1	20·2	..	8·13	7·6	7·1	7·4	7·25
I.U. per unit national currency	0·0288	0·0326	0·0417	0·0475	0·0585	0·0601	..	0·174	0·177	0·175	0·175	0·175
Real income, I.U. million	..	1870	1678	1560	1470	1215	..	1415	1345	1242	1295	1270
Real income, including imputation	..	1842	1750	1632	1537	1273	740 [c]	1482	1409	1301	1357	1330
Real income per head population	..	266	253	233	220	184	106	220	208	193	201	197
Export surplus	−3·2	−4·4	−2·7	−3·14	−2·9	−2·5	−1·6	−0·24	−0·30	−0·31	−0·29	−0·37
Net external income	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	−92	−143	−112	−150	−170	−150	..	−59	−70	−72	−68	−82
Exports, I.U. million	205	207	190	126	102	55	..	188	143	137	130	110
Imports, I.U. million	200	195	175	175	93	55	..	225	206	210	200	175
Real product, I.U. million	..	1997	1877	1733	1716	1423	740	1504	1416	1300	1355	1347
Labour force, million [e]	..	2·88	2·88	2·89	2·88	2·86	..	2·53	2·53	2·53	2·54	2·67
Numbers in work, million [d]	..	..	..	2·80	2·84	2·83	2·82	2·21	2·18	2·18	2·17	2·26
Real product per man-year	..	..	..	607	551	456	262	681	650	596	624	596
Hours per year	..	..	..	2130	2050	1885	..	2383	2377	2380	2365	2362
Real product per man-hour	..	..	..	0·285	0·269	0·242	0·145	0·286	0·273	0·250	0·264	0·252

TABLE X (*contd.*)

AUSTRIA

	1932	1931	1930	1929	1928	1925	1911–13 [b]	1911–13 [f]	1911–13 [g]	1874 [g]	1867 [g]	1859 [g]
Income at factor cost [a]	7·49	8·72	9·18	7·8	8·0	7·25	6·64	22·1	33·5	20·0	14·9	11·6
Income at market price	8·1	9·5	9·8	8·5	8·7	7·7	7·1	24·3	36·7	21·0	15·6	12·2
I.U. per unit national currency	0·171	0·173	0·166	0·166	0·171	0·192	0·186	0·186	0·186	0·160 [h]	0·163 [h]	0·166 [h]
Real income, I.U. million	1385	1643	1622	1411	1487	1477	1320	4520	6820	3360	2879	2025
Real income, including imputation	1451	1721	1699	1478	1557	1547	1383	4922	7575	3814	3268	2319
Real income per head population	216	256	253	220	233	233	207	169	150	103	93	70
Export surplus	−0·62	−0·87	−0·85	−1·07	−1·03	−0·91	..	..	..	..	..	..
Net external income	..	..	..	−0·12	−0·10	−0·10	..	..	..	..	..	..
Sum of above in I.U. million	−123	−167	−158	−198	−194	−194	..	..	..	..	..	..
Exports, I.U. million	105	165	216	237	..	..	..	..	..	..	..	..
Imports, I.U. million	197	310	350	372	..	..	..	..	..	..	..	..
Real product, I.U. million	1482	1743	1723	1541	1620	1610	1383	4922	7575	3814	3268	2319
Labour force, million [c]	2·69	2·74	2·77	2·85	2·81	2·78	3·00	12·58	21·7	14·2	13·5	12·8
Numbers in work, million [d]	2·31	2·44	2·53	2·66	2·65	2·63	2·93	12·4	21·4	14·1	13·4	12·7
Real product per man-year	642	714	681	579	611	612	472	396	354	270	244	183
Hours per year	2372	2367	2400	2400	2400	2400	(2700)	(2700)	(2750)	(3000)	(3000)	(3000)
Real product per man-hour	0·259	0·302	0·284	0·241	0·255	0·255	0·175	0·147	0·129	0·090	0·881	0·061

[*Notes overleaf*

NOTES FOR TABLE X

[a] From 1937, Oesterreichisches Institut für Wirtschaftsforschung, *Special Paper* 7, 1951. 1930–36 from same Institut's *Monatsberichte*, 1937, raised by a factor 1·24 (which equates this series to the latter series in 1937). From 1928 and 1929 from Professor Hertz, *Economic Problem of the Danubian States*, p. 207. For 1925, League of Nations. For 1911–13, Waizner, *Metron*, 1927–28 (1 krone = 1·44 schillings). 1874 and earlier quoted in Neumann-Spallart's *Uebersichten der Weltwirtschaft*. Earliest estimate by Czoernig.

[b] Territory constituting the post-1919 Republic of Austria.

[c] *Monatsbericht*, 15th May 1947, estimates that real income in 1946 was only half that of 1937.

[d] From 1929 to 1936, number of wage-earners in work given by German Institut für Konjunkturforschung, and an addition made for working proprietors (excluding women in agriculture).

[e] 1929–36, from line below, plus unemployment. For other years, estimated in proportion to population.

[f] Contemporary territory of Austria (not Hungary).

[g] Austria-Hungary, including de Fellner's estimates for Hungary adjusted to include service industries. The krone in 1911–13 was 24 to the £ and the gulden was 10 to the £, so one gulden in the earlier figures is equated to 3·456 schillings.

[h] Carried back on the basis of the purchasing power of the £.

TABLE XI

BELGIUM (billion francs)

	1952	1951	1950	1949	1948	1947	1946	1943	1938	1937	1936
Income at factor cost [a]	305·0	296·0	265·0	249·1	243·9	226·0	198·4	..	64·0	64·1	58·7
Income at market price	354	347	312	298	295	258	223	..	70·6	70·4	64·8
I.U. per unit national currency	0·0126	0·01275	0·01395	0·01379	0·01338	0·01538	0·01565	..	0·0408	0·0416	0·0449
Real income, I.U. million	4460	4424	4352	4109	3947	3968	3490	..	2881	2929	2910
Real income, including imputation	4560	4528	4454	4205	4040	4061	3572	1270 [b]	2948	2998	2979
Real income per head population	525	521	516	489	473	481	426	153	352	359	358
Export surplus [f]	0	5·9	−14·4	−1·4	−13·0	−23·4	−27·1	..	−1·1	..	..
Net external income	..	0·9	0·2	0·3	1·7	0·1	0·1	..	1·6	..	1·25
Sum of above in I.U. million	12	87	−198	−15	−151	−358	−423	..	20	..	..
Exports, I.U. million [df]	1002	1091	901	791	723	593	308	..	805	..	..
Imports, I.U. million [ef]	1180	1220	1120	980	1000	1100	870	..	930	..	..
Real product, I.U. million	4370	4208	4331	4031	3914	3912	3433	1270	2803	2860	2840
Labour force, million	3·52	3·51	3·50	3·49	3·46	3·42	3·39	..	3·69	3·67	3·66
Numbers in work, million	..	3·30	3·28	3·26	3·33	3·35	3·32	3·60	3·52	3·54	3·51
Real product per man-year	..	1275	1320	1237	1175	1168	1034	353	796	808	809
Hours per year	..	2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
Real product per man-hour	..	0·531	0·550	0·515	0·490	0·487	0·431	0·147	0·332	0·337	0·337

[contd. overleaf

TABLE XI (*contd.*)

BELGIUM

	1935	1934	1932	1930	1927	1924	1920	1913	1895	1846
Income at factor cost [a]	49·8	48·5	49·1	65·3	47·3	30·6	17·0	7·25	3·28	1·16
Income at market price	55·6	54·1	54·1	69·7	49·2	32·0	17·9	7·45	3·4	1·2
I.U. per unit national currency	0·0477	0·0484	0·0454	0·0367	0·0411	0·0645	0·0711	0·324	0·398 [c]	0·324 [c]
Real income, I.U. million	2652	2618	2456	2558	2022	2064	1273	2414	1353	389
Real income, including imputation	2715	2680	2514	2618	2073	2120	1310	2491	1396	435
Real income per head population	328	323	307	324	262	276	176	314	219	101
Export surplus [f]	..	..	..	..	..	..	..	..	..	..
Net external income	0·85	..	..	1·9	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million [d f]	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million [e f]	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	2600	2570	2400	2550	2020	2080	1310	2420	1396	435
Labour force, million	3·64	3·63	3·60	3·57	3·53	3·49	3·07	3·37	2·97	..
Numbers in work, million	3·43	3·40	3·39	3·53	3·52	3·48	3·06	3·36	2·95	1·5
Real product per man-year	758	756	708	712	574	609	428	720	473	290
Hours per year	2400	2400	2400	2400	2400	2400	2400	2900	3000	3450
Real product per man-hour	0·316	0·315	0·295	0·301	0·239	0·254	0·178	0·248	0·158	0·084

[a] Professor Baudhuin's estimates adjusted by U.N. 1938 and 1946–51; similar adjustment introduced into earlier figures. Estimate for 1920 from Mahaim; 1913 from Gini (Baudhuin's figure is only 6·5); 1895 and 1946 estimates communicated by M. van der Aa. *The Economist* (14 iii 42 and 10 vi 44) has also estimated 46 billions for 1941 and 60 billions for 1939.

[b] Trend of available real income estimated in *Federal Reserve Bulletin*, January 1945.

[c] Estimated from trend of retail prices in Britain.

[d] Base: \$1 worth of exports equated to 1·103 I.U. in 1938.

[e] Base: £1 worth of imports in 1938 valued at 5·95 I.U. as in Britain.

[f] Luxembourg included.

TABLE XII

BRAZIL (billion cruzeiros)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939
Income at factor cost [a]	298	250	210	180	158	142	91·2	71·0	65·0	51·7	39·9	36·1	33·1	30·5
Income at market price	319	262	225	192	168	151	97·4	76·7	69·4	55·0	42·8	39·2	35·9	32·9
I.U. per unit national currency	0·0325	0·0382	0·0415	0·0441	0·0432	0·0470	0·0609	0·0697	0·0865	0·1169	0·1352	0·1543	0·1662	0·1725
Real income, I.U. million	10,380	10,250	9240	8480	7260	7100	5932	5346	6003	6429	5787	6049	5967	5675
Real income, including imputation	..	..	..	8988	7498	7105	6643	5986	6723	7187	6481	6774	6683	6356
Real income per head population	..	..	..	182	155	150	146	131	151	164	151	162	162	158
Export surplus	..	..	..	−0·5	0·7	−1·6	5·2	3·5	2·6	2·5	2·8	1·2	0·00	0·62
Net external income	..	..	..	−1·8	−1·9	−1·0	−1·0	−1·0	−1·0	−1·0	−1·0	−1·0	−1·0	−1·0
Sum of above in I.U. million	..	..	..	−1·0	−52	−122	255	174	137	176	241	31	−166	−66
Exports, I.U. million [b]	..	..	..	590	640	603	640	500	500	423	410	557	539	665
Imports, I.U. million [c]	..	..	..	441	412	470	305	285	256	198	198	293	301	338
Real product, I.U. million	..	..	..	9239	7778	7366	6723	6027	6830	7236	6452	7007	7087	6749
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, million	..	..	..	16·4	16·1	15·8	15·5	15·1	14·9	14·7	14·3	14·0	13·7	13·4
Real product per man-year	..	..	..	562	483	466	434	399	459	492	451	500	516	504
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..	..	..

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TABLE XII (*contd.*)

BRAZIL

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
Income at factor cost [a]	28·0	25·7	23·6	21·7	20·0	18·3	16·8	15·5	14·2	13·1	14·0	10·1	9·8
Income at market price	30·3	27·8	25·5	23·5	21·6	19·8	18·2	16·8	15·4	14·2	15·2	10·9	10·6
I.U. per unit national currency	0·1778	0·1848	0·1986	0·228	0·240	0·260	0·257	0·257	0·250	0·225	0·225	0·220	(0·220)
Real income, I.U. million	5387	5137	5064	5358	5184	5148	4677	4318	3850	3195	3420	2398	2332
Real income, including imputation	6033	5752	5671	6000	5806	5765	5238	4835	4312	3578	3830	2686	2612
Real income per head population	153	149	152	161	159	162	149	140	128	108	117	84	83
Export surplus	−0·10	−0·22	0·63	0·24	..	..	..	..	..	..	..	..	..
Net external income	−1·0	−1·0	−1·0	−1·0	..	..	−0·78	..	..	..	..	..	..
Sum of above in I.U. million	−196	−224	−71	−174	..	..	..	..	..	..	..	..	..
Exports, I.U. million [b]	628	505	532	494	..	..	..	..	..	..	..	..	..
Imports, I.U. million [c]	326	359	314	289	..	..	..	..	..	..	..	..	..
Real product, I.U. million	6531	6122	5960	6379	6150	6100	5600	5200	4550	3750	4000	2800	2700
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, million	13·2	12·9	12·5	12·4	12·1	11·9	11·6	11·4	11·2	11·0	10·8	10·6	10·4
Real product per man-year	495	475	476	514	508	512	483	456	406	340	371	265	260
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..	..

[a] Since 1947, U.N. 1929–44, Dr. Dereksen, World Statistical Congress, 1947. 1946, International Reference Service, June 1947. 1945, Lewinsohn less 20 per cent (average discrepancy between his results and Dereksen's for the earlier years) — source, *Public Service* (in Portuguese), February 1947. 1928, German Statistiches Reichsamt. 1927, Osvaldo Miranda. 1926, Bento de Miranda.

[b] Exports worth \$1 in 1935 equated to 1·82 I.U., on the basis of the ratio between the dollar price of coffee in that year and its average for the period 1925–34. (Coffee constitutes about 70 per cent of Brazil's exports.)

[c] Imports worth \$1 in 1938 equated to 1·103 I.U.

TABLE XIII

BULGARIA (billion leva)

	1950	1949	1946	1945	1944	1943	1942	1941	1940	1939	1938	1932	1929	1926	1913[b]
Income at factor cost [a]	..	..	334·0	285·8	250·0	161·5	121·8	89·4	67·1	56·9	50·4	31·3 [d]	52·6	46·1	1·7
Income at market price	..	..	..	..	..	..	..	..	..	63	56	..	60	51	1·9
I.U. per unit national currency	..	..	0·0031	0·0035	0·0052	0·0079	0·0100	0·0133	0·0161	0·0179	0·0184	..	0·0110	0·0114	0·329
Real income, I.U. million [e]	..	..	..	..	..	..	..	..	..	1128	1030	..	660	581	625
Real income, including imputation [c]	..	..	1168	1058	1148	1242	1321	1348	1242	1325	1210	555	776	683	735
Real income per head population	224	197	167	152	167	182	195	201	196	211	194	94	137	126	163
Export surplus	..	..	−2·6	6·6	4·9	1·1	0·5	−1·0	0·0	0·9	..	0·1	−1·9	0·0	..
Net external income	..	..	..	..	..	..	..	..	..	..	..	..	−1·2	−0·9	..
Sum of above in I.U. million	..	..	−11	19	20	1	−5	−27	−16	0	..	..	−34	−10	..
Exports, I.U. million [e]	..	..	25	33	46	83	87	81	68	74	..	..	28	29	..
Imports, I.U. million [f]	..	..	40	13	30	85	82	77	66	69	..	..	55	37	..
Real product, I.U. million	1623 [g]	1410 [g]	1164	1049	1144	1239	1331	1379	1260	1330	..	568 [d]	783	685	740
Labour force, million	2·41	2·39	2·33	2·31	2·30	2·27	2·26	2·24	2·11	2·10	..	1·96	1·84	1·73	1·30
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	673	590	499	458	498	545	588	615	596	633	..	290	425	396	569
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

[Notes overleaf

NOTES FOR TABLE XIII

[a] 1939–46, official estimate, quoted by U.N. 1938 computed from the 1939 figure by deducting the mean of the 1938–39 differences shown by the other two series quoted by U.N. 1926, Dresdner Bank. 1913, Gini, *Metron*, 1933.

[b] In borders as fixed after 1918. In the 1913 borders (fixed at the end of the second Balkan War) national income was estimated at 7 per cent higher in aggregate, 1 per cent lower per head.

[c] 1940–46 from series of real incomes, on 1939 base, given by Dr. Dereksen, Econometric Society Conference, 28th December 1948.

[d] Money income, and 1932 real product at 1929 prices, estimated by Kiranoff, quoted by Woytinski, *Die Welt in Zahlen*.

[e] One dollar's worth of exports in 1939 equate to 1·15 I.U. (on comparison of Bulgarian wholesale price index in 1939 and in 1925–34); similarly 0·75 I.U. in 1929.

[f] One dollar's worth of imports in 1939 equated to 1·1 I.U., in 1929 to 0·92 I.U.

[g] Estimates of net material product on 1939 base by Matow, quoted by U.N.

TABLE XIV

CANADA (millions of Canadian dollars)

	1952	1951	1950	1949 [d]	1948	1947	1946	1945	1944	1943	1942
Income at factor cost [a]	18,307	16,079	13,794	12,501	11,905	10,495	9325	9511	9591	8915	8337
Income at market price	21,011	18,465	15,799	14,331	13,677	12,099	10,594	10,514	10,702	10,032	9422
I.U. per unit national currency [b]	0·606	0·621	0·691	0·717	0·754	0·849	0·938	1·022	1·104	1·077	1·080
Real income, I.U. million	12,726	11,467	10,917	10,275	10,312	10,272	9937	10,745	11,815	10,804	10,176
Real income, including imputation [c]	12,925	11,677	11,112	10,460	10,497	10,458	10,117	10,937	12,016	10,998	10,379
Real income per head population	894	834	810	778	797	811	801	882	979	908	868
Export surplus	..	28	146	400	592	337	570	1807	1834	1708	925
Net external income	..	−332	−383	−307	−267	−289	−253	−171	−193	−202	−203
Sum of above in I.U. million	..	−189	−164	67	245	41	298	1672	1814	1622	779
Exports, I.U. million [e]	..	1850	1690	1680	1770	1700	1670	2410	2580	2400	2130
Imports, I.U. million [e]	..	1460	1300	1210	1190	1320	1260	1090	1170	1100	1080
Real product, I.U. million	12,992 [f]	12,256	11,666	10,863	10,832	10,797	10,229	10,585	11,612	10,676	10,650
Labour force, '000 [g]	5427	5407	5284	5109	5036	4963	4924	5234	5287	5272	5052
Numbers in work, '000 [h]	5320	5322	5134	5008	4955	4872	4799	5062	5225	5197	4948
Real product per man-year	2442	2303	2272	2169	2186	2216	2131	2091	2222	2054	2165
Hours per year	2080	2090	2125	2115	2110	2125	2135	2215	2375	2440	2510
Real product per man-hour	1·174	1·102	1·069	1·026	1·036	1·043	0·998	0·944	0·936	0·842	0·863

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TABLE XIV (*contd.*)

CANADA

	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931
Income at factor cost [a]	6563	5263	4373	4018	4062	3487	3188	2897	2452	2630	3333
Income at market price	7617	6093	5106	4656	4766	4147	3773	3474	2989	3167	3890
I.U. per unit national currency [b]	1·028	1·131	1·199	1·199	1·187	1·219	1·251	1·248	1·262	1·218	1·113
Real income, I.U. million	7830	6891	6122	5583	5657	5055	4720	4336	3772	3857	4330
Real income, including imputation [c]	8007	7081	6316	5772	5840	5237	4897	4500	3918	3993	4485
Real income per head population	678	606	546	504	515	465	439	407	358	370	432
Export surplus	395	314	369	332	348	448	307	257	216	115	54
Net external income	−228	−261	−249	−241	−226	−236	−206	−211	−226	−265	−282
Sum of above in I.U. million	172	60	144	109	145	259	126	57	−13	−183	−254
Exports, I.U. million [e]	1730	1360	1270	1050	1070	1200	1010	920	830	790	840
Imports, I.U. million [e]	1100	980	750	680	760	760	590	560	460	540	730
Real product, I.U. million	8465	7401	6692	6033	6005	5508	5191	4803	4301	4426	4849
Labour force, '000 [g]	4777	4806	4607	4543	4481	4422	4359	4295	4233	4170	4110
Numbers in work, '000 [h]	4884	4388	4084	4027	4075	2857	3741	3671	3416	3437	3635
Real product per man-year	1847	1687	1638	1498	1474	1428	1388	1308	1259	1288	1334
Hours per year	2530	2505	2360	2335	2440	2435	2435	2460	2435	2445	2500
Real product per man-hour	0·730	0·673	0·694	0·642	0·604	0·586	0·570	0·532	0·517	0·527	0·534

TABLE XIV (*contd.*)

Canada

	1930	1929	1928	1927	1926	1920 [i]	1910 [i]	1900 [i]	1890 [i]	1880 [i]	1870 [i]
Income at factor cost [a]	4283	4789	4823	4417	4185	..	..	..	..	..	..
Income at market price	4876	5470	5502	5051	4797	5337	2356	1054	827	570	455
I.U. per unit national currency [b]	1·074	1·041	1·050	1·048	1·023	0·812	1·720	2·154	2·035	1·957	1·788
Real income, I.U. million	5237	5694	5777	5293	4907	4001	3752	2064	1538	1025	753
Real income, including imputation [c]	5436	5901	5988	5495	5102	4181	3930	2184	1646	1103	846
Real income per head population	533	588	610	571	540	481	552	408	341	256	230
Export surplus	−64	−88	137	157	257	..	..	..	..	..	..
Net external income	−289	−261	−229	−216	−206	..	..	..	..	..	..
Sum of above in I.U. million	−380	−364	−97	−62	52	..	..	..	..	..	..
Exports, I.U. million [e]	940	1050	1180	1030	1040	..	..	..	..	..	..
Imports, I.U. million [e]	1010	1163	1155	980	906	..	..	..	..	..	..
Real product, I.U. million	5746	6152	6110	5607	5184	..	..	..	..	..	..
Labour force, '000 [g]	4023	3934	3847	3758	3671	3279	2801	1861	1675	1429	1166
Numbers in work, '000 [h]	3532	3816	3681	3580	3490	3213	2717	1787	1591	1343	1119
Real product per man-year	1627	1612	1660	1566	1485	1301	1446	1222	1035	821	756
Hours per year	2550	2600	2600	2600	2600	2600	2795	2835	2960	3080	3200
Real product per man-hour	0·638	0·620	0·638	0·602	0·571	0·550	0·517	0·431	0·350	0·267	0·236

[*Notes overleaf*

NOTES FOR TABLE XIV

[a] From 1926, from *National Accounts, Income and Expenditure* with additional allowance for depreciation in recent years. The official report gives price indexes for residential construction, non-residential construction and machinery and equipment. Constructing an index number out of those three components equally weighted, and applying it to the official figures for depreciation, we find that the real value of allowances for depreciation which had been rising sharply up to 1942, fell after that year (because the depreciable book value of the older assets fell further and further behind their replacement cost). It is estimated that real depreciation should have continued to rise at the rate of 5 per cent per annum and therefore the following deductions are made :

	1943	1944	1945	1946	1947	1948	1949	1950	1951
$ of 1935–39 purchasing power, million .	97	175	244	351	311	366	369	381	491
Current $ million .	128	235	329	496	490	655	693	761	1150

[b] Base taken at 1·041 I.U. for 1929 and other years 1926–50 computed from implicit price index for revaluing gross national product to 1935–39 prices, as shown in the official study. This index, however, includes a revaluation of imports and exports, whereas at this stage we wish to deal solely with the internal purchasing power of the currency, and the index is therefore adjusted by excluding money imports and exports of goods and services from the dividend and real imports and exports of goods and services from the divisor. This method gives quite a close fit to the November 1946 valuation of the Canadian $ in I.U. (of 0·920) (see Table XI, Chapter II). 1901–25 and 1951 from cost of living index.

[c] For 1926 to 1942, estimates by Hope, *Canadian Journal of Economics and Political Science*, 1943. Other years based on these results.

[d] Newfoundland included after this date.

[e] $1 of exports in 1929 equated to 0·844 I.U., of imports 0·895 I.U., on basis of 1929 prices compared with 1925–34 average (prices being converted to U.S. $ for years in which exchange was not at parity). To exports are then added the I.U. value of gold production.

[f] 6 per cent increase in real product over 1951 estimated in *Canadian Statistical Review*, February 1953, p. i.

[g] Including armed forces. Data in the first place from *Canada's Economic Development 1867–1952* : other data from 1952–53 *Year Book* since 1931 : for earlier years interpolated linearly between Census results.

[h] Same sources as above. For 1926–51 Trade Union unemployment percentages used.

[i] Period 1870–1920. All data from *Canada's Economic Development 1867–1952*. Income at market prices is gross product (p. 19). Purchasing power of the dollar deduced from 1935–39 value by data given on p. 178.

Depreciation and similar charges can be deduced for 1870, 1900 and 1920 from the table on p. 27, and interpolated for the other years. These deductions are made before entering the line " Real Income ", as shown :

	Current $ million	1935–39 $	I.U.	Interpolations
1870	34	50	61	..
1880	..	..	..	90
1890	..	..	..	145
1900	96	170	206	..
1910	..	..	..	300
1920	409	275	333	..

TABLE XV

CHILE (billions of pesos)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941
Income at factor cost [a]	..	..	110·8	93·8	76·6	62·6	49·1	42·5	37·0	32·0	26·2	21·3
Income at market price	..	..	121·1	102·0	83·4	66·9	52·9	45·8	39·6	34·6	28·4	23·2
I.U. per unit national currency [b]	0·0822	0·01005	0·01225	0·01412	0·0168	0·0197	0·0266	0·0305	0·0332	0·0371	0·0432	0·0542
Real income, I.U. million [c]	..	..	1485	1440	1400	1320	1410	1397	1316	1285	1228	1259
Real income, including imputation	..	..	1546	1501	1460	1379	1468	1454	1373	1341	1283	1314
Real income per head population	..	..	266	263	259	249	270	272	260	258	250	260
Export surplus [e]	..	64	52	−32	68	10	20	48	50	46	49	50
Net external income [e]	..	−62	−58	−52	−73	−58	−38	−50	−50	−50	−50	−50
Sum of above in I.U. million	..	1	−4	−52	−3	−32	−13	−2	0	−3	−1	0
Exports, I.U. million [f]	..	151	163	172	185	181	190	194	184	179	188	188
Imports, I.U. million [f]	..	135	118	164	120	117	107	88	81	76	85	99
Real product, I.U. million	..	..	1591	1561	1528	1475	1564	1562	1476	1447	1387	1403
Labour force, '000	..	..	2050	2015	1980	1945	1910	1875	1840	1805	1770	1735
Numbers in work, '000 [d]	..	..	2044	2008	1974	1938	1903	1866	1831	1798	1765	1727
Real product per man-year	..	..	778	777	775	760	823	836	806	805	786	812
Hours per year [g]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	0·324	0·324	0·322	0·316	0·342	0·348	0·335	0·335	0·327	0·338

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TABLE XV (*contd.*)

Chile

	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Income at factor cost [a]	16·4	..	..	..	..	..	5·38	5·07	4·11	3·75	4·85	5·17
Income at market price	18·0	..	..	..	..	..	6·01	5·5	4·37	4·11	5·3	5·7
I.U. per unit national currency [b]	0·0625	0·0702	0·0715	0·0744	0·0836	0·0907	0·0930	0·0930	0·114	0·122	0·122	0·120
Real income, I.U. million [c]	1127	1092	1187	1268	1077	..	559	511	499	502	647	685
Real income, including imputation	1181	1144	1237	1316	1123	..	603	553	539	540	683	723
Real income per head population	237	233	256	277	240	..	133	124	123	125	161	173
Export surplus [e]	56	51	38	104	41	35	51	26	8	14	−9	82
Net external income [e]	−50	−50	−45	−80	−45	−45	−50	−40	−30	−25	−25	−60
Sum of above in I.U. million	7	1	−8	26	−5	−11	1	−17	−26	−12	−33	−20
Exports, I.U. million [f]	174	163	174	194	142	137	140	86	65	126	143	216
Imports, I.U. million [f]	99	88	91	88	91	81	54	42	34	83	156	171
Real product, I.U. million	1249	1218	1328	1396	1179	..	688	614	596	595	703	788
Labour force, '000	1700	1662	1624	1586	1548	..	1470	1435	1400	1369	1334	1298
Numbers in work, '000 [d]	1683	1643	1615	1581	1535	..	1410	1291	1186	1311	1304	1292
Real product per man-year	741	741	822	883	768	..	487	475	503	455	539	610
Hours per year [g]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	0·308	0·308	0·342	0·371	0·319	..	0·203	0·198	0·209	0·189	0·224	0·254

[a] From 1940, Corporación de Fomento. 1929–34 Simon, *Studies in Income and Wealth*, vol. x.

[b] Based on food prices in October 1950. Extrapolated by retail price index numbers except for 1940–45, for which period the implicit index of the Corporación de Fomento is used.

[c] 1936–40 from calculation of real income given in *Estadística*, March 1944.

[d] True unemployment assumed to be twice that shown by Employment Exchange Statistics. 1929 and 1930 assumed.

[e] In millions of U.S. $. Net external income only recorded for 1938 and 1946–51.

[f] 1 U.S. $ worth of exports in 1929 equated to 0·772 I.U., and of imports 0·867 I.U.

[g] Assumed 2400 throughout.

TABLE XVI

COLOMBIA (millions of pesos)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938
Income at factor cost [a]	..	5547	4629	3741	3153	2569	2062	1660	1339	1159	1063	1033	1049	..
Income at market price	..	5767	4780	3882	3289	2689	2164	1743	1438	1247	1131	1110	1117	..
I.U. per unit national currency [b]	0·191	0·207	0·251	0·268	0·312	0·367	0·40	0·446	0·536	0·624	0·687	0·670	0·653	..
Real income, I.U. million	..	1196	1198	1042	1028	988	867	779	772	779	778	744	730	..
Real income, including imputation	..	1302	1300	1141	1124	1081	957	866	855	859	855	817	800	..
Real income per head population	..	118	120	108	108	107	96	89	89	91	93	90	90	..
Export surplus [c]	98	51	67	−44	−95	−20	−20	29	40	46	4	11	−3	..
Net external income [c]	−53	−39	−14	−6	−9	−10	−10	−10	−10	−10	−10	−10	−10	..
Sum of above in I.U. million	25	7	33	−31	−69	−22	−24	16	25	32	−6	1	−12	..
Exports, I.U. million [d]	..	148	153	146	145	149	142	139	135	105	101	132	117	..
Imports, I.U. million [d]	..	212	162	198	222	153	117	75	56	48	95	93	125	..
Real product, I.U. million	..	1231	1258	1120	1116	1099	1006	914	909	884	867	855	804	..
Labour force, million	3·93	3·87	3·80	3·73	3·66	3·59	3·52	3·45	3·38	3·31	3·24	3·17	3·10	3·04
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	..	318	331	300	305	306	285	264	269	267	268	269	259	..
Hours per year [f]	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	0·132	0·138	0·125	0·127	0·127	0·119	0·110	0·112	0·111	0·112	0·112	0·108	..

[a] From 1946 Banco de la República figures quoted by United Nations. Earlier years, International Bank Report, 1950.
[b] Based on 1945.
[c] U.S. $ million. Net external income not estimated before 1946.
[d] Volume series begin in 1937. For that year, $1 worth of imports equated to 1·09 I.U. (U.S. prices): $1 worth of exports to 1·43 I.U. (ratio of dollar price of coffee in 1937 to 1925–34).
[e] Assumed no appreciable unemployment.
[f] Assumed 2400.

TABLE XVII

CUBA (millions of pesos)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939
Income at factor cost	1860	1683	1578	1702	1672	1255	1072	..	..	..	..	..	488
Income at market price	2098	1891	1749	1893	1869	1406	1194	..	..	..	..	..	..
I.U. per unit national currency	0·465	0·52	0·51	0·445	0·485	0·57	0·626	..	..	..	..	..	..
Real income, I.U. million	975	985	892	844	906	801	747	..	..	..	537 [a]	..	650
Real income, including imputation	1031	1040	946	896	957	851	796	..	..	..	580	..	691
Real income per head population	188	193	180	173	188	169	161	..	..	..	125	..	154
Export surplus	106	104	101	152	219	211	172	..	..	..	..	..	..
Net external income	−34	−36	−30	−51	−74	−40	−31	..	..	..	..	..	..
Sum of above in I.U. million	33	35	36	45	70	97	88	..	..	..	..	..	..
Exports, I.U. million [b]	196	184	175	204	198	161	163	..	..	..	..	..	..
Imports, I.U. million [b]	214	216	169	171	176	135	132	..	..	..	..	..	..
Real product, I.U. million	980	973	916	884	909	780	739	..	..	..	600	..	690
Labour force, '000	1730	1695	1660	1634	1609	1583	1561	..	1510	..	1462	..	1420
Numbers in work [c]	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	566	573	551	541	564	492	474	..	..	..	410	..	485
Hours per year [d]	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	0·236	0·239	0·230	0·225	0·235	0·205	0·197	..	..	..	0·171	..	0·202

[a] International Reference Service, September 1948 shows money gross product in 1947 as 3½ times that of 1941, indicating a rise of real product by 34 per cent between these years.

[b] Volume series based on 1935–39 for which period $1 worth of imports equated to 1·122 I.U. (U.S. prices) and $1 worth of exports 0·803 I.U. (dollar price of Cuban sugar, before paying customs).

[c] Assumed no appreciable unemployment.

[d] Assumed 2400.

TABLE XVIII

Czechoslovakia (billion korunas)

	1951	1950	1949	1948	1947	1946	1945	1944 [g]	1943 [g]	1942 [g]	1941 [g]	1940 [g]	1939 [g]
Income at factor cost [e]	..	..	..	213·1	194·4	155·4	..	61·3	60·8	57·1	51·5	45·5	38·9
Income at market price [f]	..	..	..	253·8	223·4	175·1	..	70·5	70	65·5	59	52	43·5
I.U. per unit national currency	..	..	..	0·0133	0·0131	0·0125	..	0·0239	0·0240	0·0238	0·0257	0·0301	0·0369
Real income, I.U. million	..	..	..	3378	2930	2188	..	1685	1680	1560	1520	1565	1605
Real income, including imputation	4040 [h]	3660 [h]	3425 [h]	3512	3074	2322	..	1819	1814	1694	1654	1699	1739
Real income per head population [i]	326	296	279	288	253	192	..	252	252	235	230	236	241
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Labour force, million	4·96	4·95	4·91	4·71	4·76	4·72	..	2·88	2·88	2·88	2·88	2·88	2·88
Numbers in work, million	4·94	4·93	4·89	4·69	4·74	4·70	..	2·87	2·87	2·87	2·87	2·86	2·84
Real product per man-year	818	744	701	724	649	504	..	635	632	590	576	594	612
Hours per year [f]	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	0·315	0·286	0·269	0·302	0·270	0·210	..	0·244	0·243	0·227	0·221	0·228	0·235

[a] Gini, *Metron*, 1933.

[b] Data from Engling and Hotovec, quoted by Dresdner Bank. *Wirtschaftliche Kräfte der Welt*, 1930, who also calculate real income at 1913 prices.

[c] Woytinski, *Die Tatsachen und Zahlen Europas*, Vienna, 1930.

[d] Smutny, *Statistiky Obzor*, vols. xii and xviii, estimates 90 billions for 1929 and 50 billions for 1935.

[e] Sources not otherwise indicated: To 1944, Stadnik, *National Income and its Division*. 1946–48, Central Planning Office.

[*Table and Notes contd. overleaf*

TABLE XVIII (*contd.*)

CZECHOSLOVAKIA

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1925–7[b]	1913
Income at factor cost[e]	56·7	60·1	52·8	52·7[d]	53·4	53·8	56·7	63·7	68·5	67·6[d]	72·8[c]	66·6	7·2[a]
Income at market price[f]	65	67·3	61·2	60·8	65	62	65	72	77	75·5	80·8	..	7·9
I.U. per unit national currency	0·0405	0·0425	0·0431	0·0435	0·0450	0·0444	0·0442	0·0433	0·0413	0·0405	0·0406	..	0·302
Real income, I.U. million	2635	2860	2640	2650	2930	2750	2880	3115	3175	3060	3280	2285	2380
Real income, including imputation	2973	3017	2796	2804	3083	2901	3030	3264	3333	3207	3425	2424	2534
Real income per head population[i]	191	209	194	196	217	204	214	232	238	231	248	179	190
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..
Labour force, million	5·84	5·77	5·76	5·73	5·71	5·68	5·66	5·63	5·60	5·55	5·50	5·33	5·33
Numbers in work, million	5·50	5·36	5·14	5·04	5·03	4·94	5·11	5·34	5·49	5·51	5·46	5·28	5·28
Real product per man-year	508	562	544	556	614	587	592	612	607	583	626	460	480
Hours per year[j]	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	0·212	0·234	0·226	0·232	0·256	0·245	0·247	0·255	0·253	0·243	0·261	0·192	0·171

[f] Difference between factor cost and market value given by Stadnik for 1937 and by Central Planning Office for 1946–48. (For 1937 the C.P.O. gives 6·0 billions against Stadnik's 7·2.) Estimated for other years from taxation data.

[g] Data for these years refer to the Bohemian-Moravian Protectorate only, excluding Sudetenland and Slovakia.

[h] From index numbers of net material product, on 1937 base, published in *Czechoslovak Economic Bulletin*, January 1952.

[i] Throughout the period 1939–44 a stationary population of 7·2 millions (as ascertained in the Census of 1943) is assumed.

[j] Assumed 2800 for 1913; 2400 for 1925–38 and 1946–48; 2600 for 1939–44 and 1949–51.

TABLE XIX

DENMARK (million krone)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Income at factor cost [c]	20,716	19,012	16,678	15,809	14,580	13,260	11,968	11,949	10,746	9476	8426	7426
Income at market price [c]	22,410	20,570	17,990	16,980	15,680	14,116	12,398	12,536	11,204	9922	8843	7854
I.U. per unit national currency	..	..	..	..	..	0·157 [a]	..	..	..	..	..	..
Real income, I.U. million [b]	2553	2606	2420	2322	2303	2218	2036	2207	2015	1818	1777	1983
Real income, including imputation	2657	2710	2524	2426	2407	2321	2138	2309	2117	1920	1879	2085
Real income per head population	618	634	597	580	581	566	529	572	535	491	485	545
Export surplus	−1200	−1298	−651	−693	−777	−1230	208	193	113	−157	−33	140
Net external income [c]	−80	−87	−75	−67	−69	−60	−40	−8	−22	−37	−50	−60
Sum of above in I.U. million	−146	−176	−98	−104	−124	−202	28	33	16	−35	−17	20
Exports, I.U. million	485	437	336	262	239	195	105	161	157	127	172	284
Imports, I.U. million	408	432	342	268	258	280	68	115	124	131	146	190
Real product, I.U. million	2880	2891	2616	2524	2512	2438	2147	2322	2134	1951	1822	2159
Labour force, '000	1931	1923	1916	1908	1900	1892	1884	1876	1868	1860	1852	1845
Numbers in work, '000	1868	1868	1857	1856	1852	1841	1808	1830	1810	1779	1755	1725
Real product per man-year	1542	1549	1410	1363	1354	1322	1189	1270	1179	1097	1038	1250
Hours per year	2420	2420	2420	2420	2420	2420	2420	2450	2450	2450	2450	2450
Real product per man-hour	0·636	0·638	0·582	0·563	0·559	0·546	0·490	0·519	0·480	0·447	0·424	0·510

[contd. overleaf

TABLE XIX (*contd.*)

DENMARK

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
Income at factor cost [c]	6942	6385	6124	5711	5435	5092	4712	4353	4660	4929	..	..
Income at market price [c]	7347	6747	6469	6042	5751	5410	4994	4593	4924	5190	..	..
I.U. per unit national currency	..	..	..	..	..	..	..	..	..	..	..	..
Real income, I.U. million [b]	2185	2075	2020	1978	1925	1867	1775	1669	1780	1787	1752	1652
Real income, including imputation	2287	2178	2124	2083	2031	1974	1883	1778	1890	1898	1862	1761
Real income per head population	601	577	566	560	549	539	505	494	530	535	529	503
Export surplus	−162	−90	−108	−105	−74	−131	−62	−18	−132	−113	−81	−79
Net external income [c]	−92	−75	−83	−90	−81	−83	−79	−75	−64	−57	−63	−50
Sum of above in I.U. million	−76	−51	−60	−64	−52	−77	−50	−34	−71	−59	−47	−42
Exports, I.U. million	362	364	374	336	326	341	370	414	420	387	354	351
Imports, I.U. million	336	317	311	326	313	325	323	315	432	448	397	384
Real product, I.U. million	2389	2276	2247	2157	2096	2067	1980	1911	1949	1896	1866	1770
Labour force, '000	1808	1770	1732	1694	1656	1618	1580	1542	1504	1467	1448	1428
Numbers in work, '000	1719	1658	1625	1601	1564	1620	1459	1416	1445	1426	1403	1378
Real product per man-year	1392	1373	1385	1348	1341	1360	1358	1350	1349	1330	1330	1284
Hours per year	2450	2450	2450	2450	2450	2450	2440	2430	2440	2450	2450	2450
Real product per man-hour	0·568	0·560	0·565	0·549	0·546	0·554	0·555	0·555	0·553	0·542	0·542	0·524

TABLE XIX (*contd.*)

DENMARK

	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915
Income at factor cost [c]	..	..	..	..	..	..	..	..	..	..	..	..	..
Income at market price [c]	..	..	..	..	..	..	..	..	..	..	..	..	..
I.U. per unit national currency	..	..	..	..	..	..	..	..	..	..	..	..	..
Real income, I.U. million [b]	1560	1580	1614	1560	1462	1398	1520	1468	1541	1482	1436	1497	1348
Real income, including imputation	1668	1686	1719	1664	1564	1499	1620	1566	1638	1578	1531	1591	1440
Real income per head population	480	489	502	490	465	450	493	509	538	524	515	542	495
Export surplus	−111	−103	−122	−212	−346	−270	−133	−1282	..	..	..	..	..
Net external income [c]	−50	−55	−70	−45	−57	−45	−40	−35	..	..	..	..	..
Sum of above in I.U. million	−52	−48	−50	−69	−114	−88	−39	−294	..	..	..	..	..
Exports, I.U. million	335	284	266	269	263	200	181	152	..	..	..	..	..
Imports, I.U. million	368	327	326	348	343	301	241	234	..	..	..	..	..
Real product, I.U. million	1687	1691	1729	1654	1598	1486	1599	1778	1649	1591	1547	1609	1462
Labour force, '000	1409	1389	1370	1350	1331	1312	1292	1214 [d]	1204	1193	1183	1172	1162
Numbers in work, '000	1347	1332	1330	1322	1298	1262	1235	1197	1187	1177	1167	1157	1147
Real product per man-year	1252	1270	1299	1250	1230	1178	1294	1486	1389	1351	1328	1390	1273
Hours per year	2450	2450	2450	2450	2450	2450	2450	2450	2600	2750	2760	2770	2780
Real product per man-hour	0·511	0·517	0·529	0·510	0·501	0·480	0·528	0·606	0·534	0·490	0·481	0·501	0·458

[*contd. overleaf*

	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1870
Income at factor cost [c]	..	..	..	..	..	..	..	..	..	..	..	..	..
Income at market price [c]	..	..	..	..	..	..	..	..	..	..	..	..	..
I.U. per unit national currency	..	..	..	..	..	..	..	..	..	..	..	..	..
Real income, I.U. million [b]	1252	1177	1166	1097	1068	1047	1128	999	970	980	1048	1134	302
Real income, including imputation	1343	1267	1255	1185	1155	1133	1213	1083	1052	1062	1129	1214	347
Real income per head population	469	446	448	428	422	421	451	411	404	412	443	481	194
Export surplus	..	−134	..	..	..	..	..	..	..	..	..	..	..
Net external income [c]	..	−45	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	−102	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	201	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	266	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	1368	1304	1280	1220	1190	1166	1246	1116	1082	1092	1159	1244	347
Labour force, '000	1151	1141	1130	1120	1107	1095	1082	1070	1057	1045	1032	1020	620
Numbers in work, '000	1136	1126	1115	1105	1092	1075	1062	1055	1042	1025	1012	1005	615
Real product per man-year	1204	1160	1148	1103	1089	1083	1175	1059	1038	1063	1142	1238	565
Hours per year	2790	2800	2820	2840	2860	2880	2900	2920	2940	2960	2980	3000	3750
Real product per man-hour	0·431	0·414	0·406	0·388	0·380	0·376	0·405	0·362	0·353	0·360	0·382	0·412	0·151

[a] Purchasing power of 0·156 in October 1946 corresponding to 0·157 for the year.

[b] Since 1930 from net national income revalued at 1935 prices as given in *National produktet og national indkomsten 1946–49*, p. 103, and subsequent communication to U.N.. rebased on 1946. Up to 1930 Mr. Kjeld Bjerke's figures submitted to the International Association for Research in Income and Wealth, linked on 1930.

[c] Pre-1938 figures adjusted in proportion to the recent revision which has reduced the 1938 figure from 100 to 75.

[d] South Jutland excluded before 1921.

TABLE XX

FINLAND (billion marks)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938
Income at factor cost [a]	..	597	405	309·0	294·0	212·6	146·7	92·0	70·32	64·01	49·85	40·79	33·61	29·90	29·59
Income at market price [a]	700	700	475	374	349·5	243·7	172·3	101·4	79·61	73·86	58·02	46·09	36·44	32·76	32·54
I.U. per unit national currency [c]	..	0·00215	0·00268	0·00294	0·00304	0·00389	0·00523	0·00733	0·0121	0·0135	0·0159	0·0185	0·0207	0·0280	0·0284
Real income, I.U. million	..	1504	1276	1101	1063	947	902	744	963	997	922	855	754	918	925
Real income, including imputation	1532	1594	1367	1193	1156	1041	998	841	1061	1097	1023	957	858	1023	1031
Real income per head population	373	393	340	301	295	270	262	224	284	294	276	258	231	277	282
Export surplus	..	31·5	−7·7	−1·9	−11 1	−3·8	−1·2	−1·57	−2·58	−4·16	−5·74	−5·88	−6·29	0·15	−0·09
Net external income [b]	..	−14·6	−10·2	−13·7	−12·8	−11·7	−9·7	−7·17	−0·05	−0·13	−0·14	−0·20	−0·14	−0·11	−0·15
Sum of above in I.U. million	..	36	−48	−46	−72	−60	−57	−64	−32	−58	−93	−112	−134	1	−7
Exports, I.U. million [d]	..	192	153	139	117	111	82	32	55	80	83	65	51	171	178
Imports, I.U. million [d]	..	241	193	179	193	148	81	29	60	95	110	125	166	197	222
Real product, I.U. million	..	1509	1375	1199	1152	1064	1056	908	1088	1140	1088	1009	877	996	994
Labour force, '000 [e]	..	1573	1567	1561	1555	1546	1534	1519	1512	1503	1491	1489	1488	1471	1446
Numbers in work, '000 [f]	..	1562	1529	1510	1551	1546	1532	1513	1508	1501	1488	1482	1480	1464	1439
Real product per man-year	..	967	899	794	743	688	689	599	721	759	730	680	593	679	690
Hours per year [g]	..	2210	2220	2210	2250	2225	2220	2250	2275	2280	2260	2210	2250	2260	2300
Real product per man-hour	..	0·437	0·404	0·359	0·330	0·309	0·310	0·266	0·317	0·333	0·323	0·308	0·263	0·300	0·300

[contd. overleaf

TABLE XX (*contd.*)

FINLAND

	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1924	1913
Income at factor cost [a]	28·41	23·51	21·05	19·92	17·44	16·59	16·68	18·90	20·52	21·33	20·10	18·12	14·7	1·23
Income at market price [a]	31·27	26·17	23·57	22·39	19·64	18·48	18·55	21·06	22·69	23·54	22·06	19·79	16·4	1·35
I.U. per unit national currency [c]	0·0289	0·0318	0·0330	0·0339	0·0342	0·0334	0·0329	0·0304	0·0286	0·0277	0·0285	0·0292	0·0296	0·345
Real income, I.U. million	905	833	778	758	672	617	611	641	650	652	629	578	486	466
Real income, including impütation	1008	932	875	853	764	707	699	726	733	733	707	654	560	546
Real income per head population	277	258	244	240	217	202	201	210	214	215	210	196	171	184
Export surplus	0·22	1·01	0·91	1·45	1·37	1·13	0·99	0·16	−0·57	−1·77	−0·06	−0·03	0·25	−0·09
Net external income [b]	−0·29	−0·27	−0·33	−0·43	−0·53	−0·58	−0·44	−0·41	−0·41	−0·35	−0·32	−0·28	−0·26	..
Sum of above in I.U. million	1	24	19	35	29	18	18	−8	−28	−59	−11	−9	0	−105
Exports, I.U. million [d]	209	194	174	163	150	130	124	122	136	128	130	116	102	90
Imports, I.U. million [d]	235	185	160	145	112	94	106	136	149	162	131	112	95	96
Real product, I.U. million	981	917	870	836	773	725	699	720	748	758	717	667	567	645
Labour force, '000 [e]	1420	1393	1367	1344	1319	1290	1263	1241	1228	1216	1198	1181	1142	997
Numbers in work, '000 [f]	1413	1383	1353	1324	1285	1255	1240	1225	1220	1213	1194	1177	1139	993
Real product per man-year	693	662	642	631	602	576	654	588	613	625	599	567	499	647
Hours per year [g]	2250	2230	2240	2220	2190	2160	2080	2160	2300	2300	2300	2300	2300	2800
Real product per man-hour	0·308	0·297	0·287	0·284	0·275	0·267	0·271	0·272	0·266	0·272	0·261	0·246	0·217	0·231

[a] 1926–49 from Laurila, *Statistiska Översiktu*, 1950 (excluding Reparations, 1945–51). 1913 and 1924 from Dresdner Bank, *Wirtschaftliche Kräfte der Welt*, 1930.

[b] Laurila's figures to 1949, thence International Monetary Fund 1945–51. Includes Reparations.

[c] 1926–49, recomputed from implied index number in Laurila's calculations, on 1929 base. Other years from retail price index.

[d] $1 worth of imports in 1929 equated to 0·842 I.U. and of exports to 0·846 I.U., on basis of 1929 prices compared with 1925–34 averages.

[e] Census data 1910–40, interpolated and extrapolated by Laurila's figure of numbers of working age. [f] Actual unemployed assumed at twice registered.

[g] Recorded except for 1924–28, which were assumed to be the same as 1929.

TABLE XXI

FRANCE (billions of francs)

	1952	1951	1950	1949	1948	1947	1938	1937	1936	1935	1934	1933	1932
Income at factor cost [a]	10,190	9082	7117	6539	5430	3303	327	266	221	193	196	219	227
Income at market price	12,015	10,631	8377	7484	5919	3601	358	294	249	221	225	244	252
I.U. per unit national currency [b]	0·00176	0·00195	0·00230	0·00255	0·00301	0·00478	0·0401	0·0459	0·0570	0·0624	0·0594	0·0570	0·0546
Real income, I.U. billion	21·1	20·7	19·3	19·1	17·8	17·2	14·4	13·5	14·2	13·8	13·4	13·9	13·8
Real income, including imputation	21·8	21·5	20·1	19·9	18·6	18·01	15·1	14·2	14·9	14·5	14·1	14·6	14·5
Real income per head population	512	509	480	480	451	442	366	344	361	351	341	353	351
Export surplus	−188	−127	3	−142	−239	−174	−15	−18	−10	−5	−5	−10	−10
Net external income	..	−10	−9	8	14	10	4	4	4	4	3	2	1
Sum of above in I.U. million	−366	−267	−11	−342	−677	−784	−441	−641	−341	−62	−119	−455	−493
Exports, I.U. million [c]	2508	2860	2400	1770	1200	1020	1470	1370	1250	1320	1470	1470	1430
Imports, I.U. million [c]	2503	2460	2100	2000	1940	2300	1980	2220	2090	1930	2040	2410	2300
Real product, I.U. billion	22·2	22·2	20·4	20·0	18·5	17·5	15·0	14·0	14·4	14·0	13·7	14·1	14·1
Labour force, million [d]	17·5	17·4	17·4	17·4	17·4	17·5	17·4	17·4	17·4	17·6	17·8	18·0	18·2
Numbers in work, million [e]	17·4	17·3	17·3	17·3	17·3	17·4	16·6	16·6	16·5	16·8	17·1	17·3	17·5
Real product per man-year	1276	1283	1179	1156	1069	1005	904	844	873	834	801	815	806
Hours per year [f]	2295	2295	2285	2255	2305	2295	2030	2140	2455	2425	2435	2450	2380
Real product per man-hour	0·556	0·559	0·516	0·513	0·464	0·438	0·444	0·394	0·355	0·344	0·329	0·332	0·338

[contd. overleaf

TABLE XXI (*contd.*)

FRANCE

	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1913
Income at factor cost [a]	252	267	270	250	231	229	189	170	147	131	126	121	36·1
Income at market price	290	300	300	280	259	255	208	188	163	146	140	133	38·6
I.U. per unit national currency [b]	0·0501	0·0483	0·0495	0·0560	0·0574	0·0583	0·0717	0·0764	0·0840	0·0944	0·0907	0·0816	0·257
Real income, I.U. billion	14·5	14·5	14·9	15·7	14·9	14·9	14·9	14·4	13·7	13·8	12·7	10·9	9·9
Real income, including imputation	15·2	15·2	15·7	16·5	15·7	15·7	15·2	15·7	14·5	14·6	13·5	11·7	10·6
Real income per head population	368	371	385	406	389	391	394	383	369	377	348	303	266
Export surplus	−12	−10	−8	−2	2	0	2	2	−2	−3	−3	−23	−0·6 [j]
Net external income	3	4	5	2	1	0	2	1	1	1	1	0	1·9
Sum of above in I.U. million	−451	−290	−158	0	172	0	283	230	−84	−189	−181	−1875	335
Exports, I.U. million [c]	1870	2180	2450	2460	2440	2240	2060	1980	1720	1440	1390	1440	1670
Imports, I.U. million [c]	2760	2790	2600	2260	2130	2170	2070	2250	2130	2110	1600	2230	1960
Real product, I.U. billion	14·8	14·9	15·7	16·7	15·8	15·8	15·4	14·7	14·2	14·1	13·5	12·8	10·0
Labour force, million [d]	18·4	18·3	18·2	18·2	18·1	18·0	18·0	18·0	18·0	18·0	18·0	18·0	17·8
Numbers in work, million [e]	17·9	18·0	17·9	17·9	17·8	17·8	17·8	17·8	17·8	17·8	17·7	17·7	17·5
Real product per man-year	826	829	877	933	889	889	865	826	799	793	763	723	571
Hours per year [f]	2490	2580	2630	2630	2630	2630	2630	2580	2580	2580	2580	2580	3160
Real product per man-hour	0·332	0·321	0·333	0·356	0·338	0·338	0·329	0·320	0·310	0·307	0·296	0·280	0·181

TABLE XXI (*contd.*)

FRANCE

Figures[g] *for decades centred on :*

	1900	1890	1880	1870	1860	1850	1840	1830	1820	1810
Real income, I.U. billion [h]	8·40	6·85	5·37	4·80	4·39	4·16	3·51	2·88	2·67	2·32
Real income, including imputation	9·00	7·40	5·88	5·27	4·84	4·61	3·96	3·32	3·11	2·76
Real income per head population	231	193	156	143	133	130	115	100	99	92
Net income from foreign investments,[i] million francs	770	690	510	600	..	180	..	..	..	..
Net income from foreign investments,[i] million I.U.	212	184	128	160	..	59	..	..	..	..
Real product, I.U. billion [k]	8·79	7·22	5·75	5·11	4·74	4·55	3·96	3·32	3·11	2·76
Labour force, million	16·4	15·5	14·8	15·2	14·6	14·0	13·4	12·8	12·2	11·7
Numbers in work, million	16·2	15·3	14·6	15·0	14·4	13·8	13·2	12·6	12·0	11·5
Real product per man-year	543	472	394	341	328	329	300	263	259	240
Hours per year	3180	3320	3600	3750	3750	3750	3750	3750	3750	3750
Real product per man-hour	0·171	0·142	0·109	0·091	0·088	0·088	0·080	0·070	0·069	0·064

[*Notes overleaf*

NOTES FOR TABLE XXI

[a] Annual figures of national income from 1920 to 1938, inclusive, were prepared by M. Dugé de Bernonville and published in the May-June issue of the *Revue d'Économie Politique* in 1935 and subsequent years. From 1946 onwards official estimates have been supplied to United Nations and published by them in *National Income Statistics 1938 to 1948* and in their *Monthly Bulletin.* But United Nations also publishes in *National Income Statistics* the results of a study by MM. Froment and Gavanier (*Revue d'Économie Politique,* September-October 1948) showing a national income figure for 1938 nearly 35 per cent above that of M. Dugé de Bernonville. In *Revue d'Économie Politique,* September-October 1947, the same authors also give an estimate for 1929, raised above M. Dugé de Bernonville's by a similar proportion. But in *National Income Statistics* M. Dugé de Bernonville's figures are given (p. 230) unchanged up to the mid-'thirties, followed by a rather violent adjustment to the higher figure for 1938.

	National Income (extrapolated backwards from 1913 figure at 1·8 % p.a. rate of growth), frs. md.	Sauvy-March Series *	Prices 1900 Base, adjusted by Portzamparc-Froment Series to give Average for Decade centred on Year indicated	Real Income at 1900 Prices, frs. md.
1913	36·1	..	109 †	33·1
1910	..	104	..	..
1900	28·7	100	102	28·1
1890	24·0	103	105	22·9
1880	20·1	110	112	17·95
1870	16·85	103	105	16·05
1860	14·1	95½	96	14·7
1850	11·8	85½	85	13·9
1840	10·0	84½	85	11·75
1830	8·3	83½	86	9·65
1820	6·95	80	78	8·9
1810	5·8	74	75	7·75

* The figure for 1930 is 580 in this series, which gives us a link with post-1913 data.
† Single year.

The Froment-Gavanier results were extensively criticised by Professor Perroux in his book *Le Revenu national,* and no effective reply to these criticisms has appeared. It is probably true that M. Dugé de Bernonville made inadequate allowance for evasion of income tax. An independent estimate of the net income of agriculture by M. Klatzmann (*Études et Conjoncture,* December 1947) would indicate about 60 milliard francs in 1938 or 51 milliard in 1932 if we allow for the lower prices in the earlier year (the volume of production in the two years having been about the same). M. Dugé de Bernonville's figure for 1932 needs to be raised by about 20 per cent to agree with M. Klatzmann's estimate. In the main table, M. Dugé de Bernonville's figures are raised by 10 per cent throughout. For 1938 is taken the mean of his figure so raised and the Froment-Gavanier figure.

The post-war definition excludes National Debt interest. The pre-war estimate is obtained by adding 10 per cent to M. Dugé de Bernonville's figures before deducting such interest.

[b] Up to 1938, based on 1929 purchasing power of the franc of 0·0495 I.U.

[c] Manufactures predominate in France's exports, and food and raw materials in her imports, almost to the same extent as in Britain. Likewise, her prices have

probably been somewhat out of accord with world prices for a considerable period. As with Britain, therefore (see *Review of Economic Progress*, July-August 1951), the base for revaluation of imports and exports is taken as 1913. $1 worth of manufactured goods (i.e. French exports) in that year is equated to 1·254 I.U. of food, and raw materials to 1·208 I.U.

[d] Occupied population is defined throughout so as to exclude females engaged in agriculture. This is in accordance with the definition of labour force used in international comparisons of agricultural productivity. It is necessary in any case, because of the erratic jumps shown by the figures owing to changes in administrative procedure by the French Census Authorities. For the earlier years are used Professor Simiand's interpretations in *Le Salaire*. The figure for 1946 includes half a million prisoners of war; it is assumed that these were all repatriated by the end of 1947. The labour force in May 1951 (excluding women engaged in agriculture) can be estimated at 17·44 millions from data published in *Bulletin de la Statistique Générale* in October 1951.

[e] Fairly precise figures of unemployment are obtained in Census years. At each Census from 1896 to 1921 the figure was in the neighbourhood of 1½ per cent of the labour force. For 1926 (a year of extreme inflation) the figure fell to 0·8 per cent, and for 1931 stood at 453,000, or 2½ per cent of the labour force. It is assumed that unemployment was 1 per cent of the labour force for the period 1922–26 and 1½ per cent for all other years up to 1930. In 1931 registered unemployment was only 56,000 while the Census showed 453,000. In 1936 registered unemployment was 431,000 while the Census showed 864,000. For each year from 1931 to 1938 inclusive it is assumed that the actual number of unemployed exceeded the registered number by 400,000. Unemployment was estimated by the Statistique Générale at 140,000 in May 1951, and is assumed to have been at about this level since 1946.

[f] A review of changes in French working hours from 1848 was prepared by a writer in *Economic Journal*, 1913. This shows hours falling from 12 per day in 1848 to 11 in 1900, and to 10 hours in some trades from 1904 onwards. Jeans in *England's Supremacy*, published in 1885, gave 66 hours as the average working week of French industrial establishments at the time.

Average Hours per Day calculated * from Returns of "Conseils de Prud'hommes"

Year	Paris		Rest of France	
	Males	Females	Males	Females
1896	9·5	10·0	10·4	10·2
1901	9·77	10·5	10·3	10·3
1906	9·5	10·55	9·95	9·94
1911	9·75	11·75	10·05	9·95
1916	10·6	13·2	9·76	9·47
1921	8·65	9·92	8·21	8·06
1924	8·47	..	8·41	8·22
1925	8·65	..	8·35	8·10
1926	8·75	..	8·38	8·20
1927	9·05	..	8·28	8·32
1928	8·75	..	8·25	8·15
1929	8·74	..	8·21	8·11
1930	8·75	..	8·24	8·19

* By comparing daily and hourly wage quotations.

In a report of the Commissariat Général du Plan, dated 15th March 1950, Professor Fourastié gives average annual hours on the railways at 3876 in 1890 and 3747 in 1900, falling to 2000 in 1937.

In addition we have a study by M. Magron (Commissariat Général du Plan, September 1948), showing average hours in manufacture since 1913. As paid holidays commenced in 1936 he makes an appropriate reduction (now 7·2 per cent). No deductions are made for sickness or absenteeism, the combined effect of which he estimates at 7 per cent (surely a very high figure unless absenteeism is defined in an unusual manner; 3 per cent should suffice abundantly to allow for sickness). As he has already allowed for paid holidays (which did not exist before 1936), we should multiply his daily figures by 313 to get average annual hours.

According to the *Bulletin de la Statistique Générale* for October 1951, the average working week (excluding agriculture) in May 1951 was 44·6 hours excluding sickness, absenteeism and holidays; or 45·8 hours if agriculture is included. In order to re-include men absent through illness and absenteeism and such holidays as are taken in May, we should add about 2 hours to these figures. To convert weekly figures to annual we should multiply by 48·5 (to allow for paid holidays). This gives us a general average of 2320 hours per annum for 1951, or about 100 less if agriculture be excluded. A difference of about 100 hours per year between the totals inclusive and exclusive of agriculture is also obtained for the 1920s when agricultural hours per week were 50 for labourers and 75 for stockmen (Augé-Laribé, *International Labour Review*, vol. 25). M. Magron's figures are therefore raised throughout by 100 hours per annum.*

[g] For the pre-1913 period we have an extraordinary number and diversity of estimates of French national income or product. These have now for the first time been subjected to a careful and critical scrutiny by the Institut de Science Économique Appliquée (Paris).† A first draft of these inquiries was presented at the Royaumont Conference (August 1951) of the International Association for Research in Income and Wealth.

The authors of the preliminary study show that a number of estimates are mere duplications or re-statements, and that those of original validity are compiled on widely varying bases. However, by a crude, but ingenious, statistical technique they allow for varying definitions, and extract from the data the maximum information on the general trend through the nineteenth century. A provisional conclusion is that, from 1780 up to 1913, there was a more or less steady rate of increase of 1·8 per cent per annum in the money value of French national income.

Available data are not sufficiently precise to give more reliable figures or to give rates for different periods. This would require careful research through a great mass of records whose real contents are as yet unknown.

In the paper referred to M. Guilbaud quotes a price series prepared by March (*Salaires et coût de l'existence à diverses époques jusqu'en 1910*, Paris 1911, p. 105). This series is made more valuable through Professor Sauvy's having brought it up to date in *Richesse et population*. In linking this series to 1930, Professor Sauvy takes account of the comparatively low relative prices, in 1930, of motor cars and other new commodities, thus giving a somewhat more favourable picture of real income in recent years than would be obtained by use of the official index numbers. M. Guilbaud quotes another series of prices with a broadly similar trend to March's (Portzamparc and Froment, Institut de Conjoncture, *Étude spéciale*, No. 1) giving the data for each single year, and therefore gives rather more satisfactory decadal estimates of prices. The Sauvy-March series is used to link prices to 1930.

[h] Based on 9·9 billion I.U. in 1913.

* Except for 1913, for which year M. Magron gives 2080 hours exclusive of agriculture. It will be seen that a somewhat higher estimate is preferred.

† The preliminary study was completed by MM. Albert Guilbaud, Malissen and Mayer, and was published in *Income and Wealth* (Series II), Bowes and Bowes Cambridge.

[i] As given by White in *The French International Accounts* and Simiand in *Le Salaire*, vol. iii, p. 97.

[j] Figures as given raised by 900 million francs to allow for undervaluation of exports (see White, *The French International Accounts*).

[k] Real income less income from foreign investments. Not sufficient data to allow for changes in terms of trade.

TABLE XXII

GERMANY (billions of marks)

	1953	1952 [a]	1951 [a]	1950 [a]	1949 [a]	1948 [ab]	1944 [f]	1943 [g]	1942 [g]	1941 [g]	1940 [g]	1939 [g]	1938 [g]	1937
Income at factor cost [f]	..	..	90·20	71·70	63·24	29·45	..	..	..	97·8	92·5	89·8	82·1	73·8
Income at market price	..	..	105·95	83·78	73·55	32·43	135	132	128	124	116	113	94	85·2
I.U. per unit national currency [h]	..	..	..	0·200	..	..	0·311	0·333	0·333	0·338	0·345	0·358	0·357	0·351
Real income, I.U. billion	..	..	19·32 [e]	16·76	14·50 [e]	12·63 [e]	47·9 [i]	47·5 [i]	46·3 [i]	44·7 [i]	42·2 [i]	41·9 [i]	35·2 [i]	31·4 [i]
Real income, including imputation	..	..	19·74	17·18	14·92	13·05	48·8	48·4	47·2	45·6	43·1	42·8	36·1	32·2
Real income per head population	..	..	410	360	317	281	602 [c]	596	82	563	534	535	485	475
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income [j]	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	21·87 [d]	20·73 [d]	19·74	17·18	14·92	13·05	48·8	48·4	47·2	45·6	43·1	42·8	36·1	32·2
Labour force, million	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, million [k]	18·85	18·2	17·72	16·85	16·49	16·47	39·5	40·4	38·5	38·0	35·9	34·7	32·3	27·4
Real product per man-year	1160	1139	1114	1020	905	792	1235	1198	1227	1201	1200	1233	1119	1174
Hours per year [l]	2480	2375	2375	2410	2325	2120	2520	2525	2540	2570	2525	2490	2425	2405
Real product per man-hour	0·483	0·480	0·469	0·423	0·389	0·374	0·491	0·474	0·483	0·467	0·475	0·495	0·460	0·489

TABLE XXII (*contd.*)

GERMANY

	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1913[m]	1913[n]
Income at factor cost [f]	65·8	59·1	52·8	46·5	45·2	57·5	70·2	76·1	75·4	70·8	62·7	60·0	45·7	50·1
Income at market price	77·0	69·8	61·9	54·7	51·3	63·1	76·6	82·5	82·9	76·6	68·3	64·8	47·8	52·5
I.U. per unit national currency [h]	0·348	0·344	0·342	0·343	0·327	0·283	0·256	0·242	0·246	0·253	0·259	0·258	0·380	0·380
Real income, I.U. billion	28·2 [i]	24·05	21·18	18·80	16·78	17·90	19·62	19·95	20·38	19·38	17·70	16·73	18·58	19·95
Real income, including imputation	28·95	24·78	21·88	19·48	17·43	18·53	20·22	20·53	20·96	19·96	18·28	17·31	19·28	20·77
Real income per head population	430	370	330	295	265	284	311	317	325	312	287	274	318	310
Export surplus	..	0·1	−0·3	0·7	1·1	2·9	1·6	0·0	−1·7	−3·4	0·4	−3·1	..	−0·7
Net external income [j]	..	−0·55	−0·62	−0·85	−1·06	−2·19	−2·78	−3·14	−2·55	−1·93	−1·36	−1·06	..	1·0
Sum of above in I.U. million	..	−155	−315	−51	13	200	−302	−760	−1040	−1350	−247	−1070	..	115
Exports, I.U. million	..	1620	1500	1680	1790	2600	2860	3010	2710	2380	2290	2050	..	3250
Imports, I.U. million	..	1800	1970	1870	1900	2040	2410	2710	2810	2900	2010	2270	..	2730
Real product, I.U. million	28·95	24·76	21·73	19·34	17·31	18·89	20·97	21·59	21·90	20·79	18·81	18·16	19·59	21·08
Labour force, million	..	..	..	..	..	..	..	..	..	..	..	..	20·6	23·0
Numbers in work, million [k]	26·3	25·3	24·6	22·7	22·1	23·9	26·0	27·4	26·8	27·1	26·1	27·8	20·3	22·7
Real product per man-year	1102	981	884	853	783	791	807	788	817	766	721	652	966	931
Hours per year [l]	2321	2268	2275	2192	2118	2164	2258	2347	2343	2359	2236	2345	2956	2956
Real product per man-hour	0·475	0·432	0·388	0·389	0·370	0·365	0·357	0·336	0·348	0·324	0·322	0·278	0·326	0·314

[*contd. overleaf*

TABLE XXII (*contd.*)

GERMANY

	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900
Income at factor cost [o]	47·6	45·6	44·0	42·5	40·9	39·7	37·7	35·2	33·8	32·6	31·8	31·3	30·9
Real income, I.U. billion [p]	19·58	19·18	18·81	18·42	18·01	17·63	17·22	16·88	16·40	16·08	15·75	15·38	15·07
Real income, including imputation	20·40	20·00	19·64	19·23	18·84	18·46	18·05	17·71	17·23	16·90	16·57	16·20	15·89
Real income per head	308	306	304	302	300	298	295	294	290	288	287	285	283
Real product, I.U. billion [q]	20·99	20·53	20·31	19·84	19·22	18·85	18·69	18·40	17·88	17·58	17·21	16·70	16·33
Labour force, million [r]	22·7	22·4	22·1	21·8	21·5	21·2	20·9	20·6	20·2	19·9	19·6	19·2	18·9
Numbers in work, million [s]	22·2	22·0	21·5	20·8	20·5	20·7	20·4	20·0	19·5	19·3	19·1	18·8	18·6
Real product per man-year	946	933	945	956	938	912	916	920	918	912	902	888	878
Hours per year	2970	2985	3000	3015	3030	3045	3060	3075	3090	3105	3120	3135	3150
Real product per man-hour	0·318	0·313	0·315	0·317	0·309	0·299	0·299	0·299	0·297	0·293	0·289	0·283	0·279

	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1883	1877	1860
Income at factor cost [o]	29·8	28·6	27·6	26·7	25·9	25·4	25·0	24·8	24·8	24·0	17·5	15·0	12·0
Real income, I.U. billion [p]	14·73	14·41	14·19	13·89	13·69	13·42	13·27	13·03	12·98	12·63	8·56	7·20	5·21
Real income, including imputation	15·55	15·24	15·00	14·70	14·50	14·22	14·05	13·80	13·73	13·37	9·49	7·75	5·70
Real income per head	281	280	280	278	279	277	277	274	276	271	206	177	152
Real product, I.U. billion [q]	16·15	16·00	15·76	15·46	15·18	14·91	14·85	14·61	14·41	13·99	10·54	8·76	5·70
Labour force, million [r]	18·6	18·3	17·9	17·6	17·3	17·0	16·8	16·5	16·3	16·1	14·5	13·5	11·5
Numbers in work, million [s]	18·3	18·0	17·5	17·2	16·8	16·4	16·2	15·9	16·0	15·9	14·3	13·2	11·4
Real product per man-year	883	889	900	899	904	909	917	919	901	880	737	664	500
Hours per year	3160	3170	3180	3190	3200	3210	3220	3230	3240	3250	3300	3300	3300
Real product per man-hour	0·279	0·280	0·283	0·281	0·282	0·283	0·285	0·284	0·278	0·271	0·223	0·201	0·151

NOTES FOR TABLE XXII

[a] Present territory of West German Federal Republic.

[b] Annual rate for second half-year.

[c] Professor Donner estimates that real national income per head in 1946 had fallen to 58 per cent of its 1936 level.

[d] From trend of real volume of gross product, as published in *Vierteljahrshefte zur Wirtschaftsforschung* for the first quarter of each year.

[e] Deduced from 1950 by official figures of trend of real income at 1936 prices.

[f] Except for the figures for the last few years for Western Germany, this line gives the officially estimated figures, which are at market prices, but on the definition then used regarding public finance. The exclusion from national income of the value of a number of public services must be rectified for purposes of international comparison. For the years 1929–40 this has been undertaken by Professor A. J. Brown (*Bulletin of International News*, 28th June 1941). For 1913 and 1925–28 similar calculations can be made, which check with Professor Brown's results for 1929. (From national income as published, deduct In Privateinkommen nicht enthaltene Steuern, deduct proceeds of income taxes, and also deduct National Debt interest: then add back the whole proceeds of Steuern und Zölle, plus any net excess of expenditure over revenue.) For years prior to 1913 adjustment is made proportionately to that of 1913. This gives us a series of national income at market prices (not at factor cost), internationally comparable. (For 1939 and subsequent years import surplus, and tribute receipts expended abroad, are excluded.) The corrected figure is given in the line below. These figures exclude National Debt interest.

[g] Including from the date of annexation, Austria, Sudetenland and Memel, but not other annexed territories. Not including tribute from occupied countries, or black market incomes.

[h] Based on 1929. Before 1913, wholesale prices indexes. Between 1913 and 1935 it is calculated from wholesale and retail price indices, using as weights the estimated values of consumption shown in the *Wirtschaftsrechnung* of 1927–28, and of investment from the Institut für Konjunkturforschung estimates of the total of net investment in Germany at the same date. The ordinary cost-of-living index number would provide a fairly good approximation, but it does not cover investment goods, and being an index representative of working-class consumption, gives too high a weight to food and rent at the expense of other consumption goods. Investment goods are represented by building costs and by the wholesale-price index numbers of industrial and agricultural equipment.

	(Base 1925–34=100)			
	Weights	1913	1928	1935
Consumption goods:				
Food	36	72·6	111·1	87·5
Rent	10	86·9	109·0	105·2
Clothing	13	68·1	116·0	76·8
Fuel	4	75·0	102·2	94·5
Others	26	62·4	106·0	97·6
Investment goods:				
Building	5	63·6	114·4	83·8
Agricultural equipment	1	77·6	108·2	86·2
Industrial equipment	5	77·6	105·9	88·1
TOTAL	100	70·7	109·6	90·6

Not only since 1939 but from 1934 onwards, Government expenditure represented a large proportion of national income. Government expenditure above normal is separately revalued to I.U. on the basis of estimated sterling equivalents of the purchasing power of the reichsmark in military expenditure, published by Professor A. J. Brown in *Bulletin of International News*.

In the *Bulletin* for 9th March 1940 he estimated the purchasing power of the reichsmark in military expenditure in 1937 at $\frac{1}{14}$ of the £ or 0·402 I.U. (Mr. Balogh, in *International Affairs*, March 1939, estimated this equivalent at $\frac{1}{15}$ for 1938.) Professor Brown in his book *Applied Economics* gives the 1938 reichsmark a purchasing power of 15·1 to the £ or 0·358 I.U. over consumption goods and services, 13·5 to the £ or 0·400 I.U. over Government services and investment goods. By 1942 (*Bulletin*, 5th February 1944) Professor Brown estimated that its purchasing power was $\frac{1}{11}$ of that of the current £, or 0·381 I.U. In *Applied Economics* Professor Brown gave the 1944 reichsmark a purchasing power of 9·6 to the £ or 0·386 I.U. Professor Brown's figures are taken as a base and coefficients for other years between 1936 and 1944 calculated from the ratio between real and money product in the U.S.S.B.S. survey.

Revaluing the 1929 purchasing power of the reichsmark to 1938 by means of index numbers makes it only 0·297 I.U. The difference between this and Professor Brown's figure of 0·358 I.U. for its purchasing power over consumption goods is apportioned evenly over the period 1929–38.

Military expenditure [1] up to 1938 is from Otto Nathan (National Bureau of Economic Research, *Occasional Paper 20*). From 1939 onwards changes in both military and non-military production, in real terms, are as given in *The Effects of Strategic Bombing*. The 1939 base figure for military expenditure is Government expenditure from the above source, less non-military expenditure as estimated by Professor Brown (*Bulletin*, 26th June 1941). The base figure for non-military production is obtained on the assumption that 14·5 milliard reichsmarks of the 1939 gross capital formation represented necessary repairs and replacements. The entries after 1935 refer to consumable goods and services only.

[i] Including the following estimates for governmental expenditure and net investment.

	1936	1937	1938	1939	1940	1941	1942	1943	1944
Billion marks	27	32	38	43	49	59	69	74	80
Billion I.U.	10·8	12·8	15·2	16·8	19·1	22·7	26·6	28·5	30·8

[j] Reparations payments as well as interest and dividends taken into account.

[k] Since 1948, official statistics of numbers employed, plus 3 millions for employers and independent workers. Labour force, excluding agricultural employment of German women but including all foreign female labour and armed forces for 1939 and subsequent years, from *The Effects of Strategic Bombing on the German War Economy*, pp. 203 and 207. These data refer to Altreich, Austria, Sudetenland and Memel, but not to territory subsequently incorporated, and refer to 31st May of each year.[2] 1925–38, contributors to social insurance, plus an allowance of

[1] The Institut für Wirtschaftsforschung in *Die deutsche Wirtschaft zwei Jahre nach dem Zusammenbruch* (post-war) estimates military expenditure as follows (Rm. md.): 1933–34 1·9, 1934–35 1·9, 1935–36 4·0, 1936–37 5·8, 1937–38 8·2, 1938–39 18·4.

[2] The following information is of interest:

	1939	1940	1941	1942	1943	
Included in numbers in work:						
Active strength of Forces, millions	1·4	5·6	7 2	8·6	9·6	9·1
Foreign labour and prisoners of war, millions	0·3	1·2	3·0	4·2	6·3	7·1
Not included in numbers in work:						
Cumulative losses of Forces, millions	..	0·1	0·2	0·8	1·7	3·3

2·5 millions for public officials and other exempt workers and employers and independent and family workers as shown by the Census (6·7 millions in 1925, 6·9 in 1933, 6·3 in 1939, excluding women in agriculture).

[l] Average hours per day worked by industrial workers since 1928 are shown in the official *Statistical Year Book.* For 1925–27 estimates must be made on the basis of Trade Union figures of the proportion in short-time work.

Hours of labour from 1937 onwards from Statistisches Reichsamt, quoted in *The Effects of Strategic Bombing on the German War Economy*, p. 215. These are on a weekly basis.

Regarding hours about 1913, the following information has been summarised from Abstract of Foreign Labour Statistics (Board of Trade):

	Average Hours per Day
Coal mines:	
Underground	8·4
Surface	11·0
Other mines:	
Underground	8·7
Surface	11·6
Railwaymen	9·0
Building	9·8
Glass	9·5
Miscellaneous	9·8
Woodwork	9·5
Assumed general average	9·65

In 1885, according to Jeans's *England's Supremacy*, hours were 66 per week or 11 per day.

[m] Versailles frontiers.

[n] Contemporary frontiers.

[o] From 1891, Reichsamt estimates. Earlier years, Dr. Jostock, I.A.R.I.W. Conference 1951.

[p] Extrapolated back from 1913 by Dr. Jostock's series of real income at 1928 prices.

[q] Assuming that the effect on net income of changes in terms of trade moved in proportion to the corresponding British figures, and that net external income rose linearly to its 1913 level from zero in 1875.

[r] Interpolated from Census data, excluding women engaged in agriculture.

[s] Trade Union unemployment reweighted to allow for the overweighting of engineering, and multiplied by a factor of 0·633 to allow for rural population and employers and independent workers.

TABLE XXIII

GREAT BRITAIN (£ million) (Ireland excluded throughout)[a]

	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Income at factor cost[d]	..	12,626[c]	11.635	10,648	10.261	9734	8876	8311	8341	8366	8171	7664	6941	5980
Income at market price[e]	..	14.496	13.439	12.240	11,733	11.200	10.204	9498	9580	9661	9490	8894	8047	6824
I.U. per unit national currency[f]	..	2·070[g]	2·195[g]	2·416	2·503[g]	2·573[g]	2·749[g]	2·968[g]	..	..	..	..	..	..
Real income, I.U. billion	..	30·01	29·50	29·57	29·37	28·82[j]	28·05[j]	28·19[j]	..	..	..	..	..	..
Real income, including imputation[b]	..	29·65	29·15	29·23	29·04	28·50	28·04	28·29	..	..	..	..	..	..
Real income per head population	..	604	597	599	599	592	588	598	..	..	..	..	..	..
Export surplus	..	−783	−1194	−380	−446	−448	−615	−351	..	..	..	..	..	..
Net external income[p]	..	61	116	144	78	76	80	71	..	..	..	..	..	..
Sum of above in I.U. million	..	−1495	−2366	−570	−921	−957	−1470	−831	..	..	..	..	..	..
Exports, I.U. million[o]	..	3630	3870	3840	3340	3035	2386	2170	1006	680	635	789	1227	1578
Imports, I.U. million[o]	..	4700	5200	4610	4610	4250	4050	3565	3215	4150	4000	3635	4250	4885
Real product, I.U. million	31·15[k]	30·04[k]	30·16[k]	29·03[k]	28·26[k]	27·41[k]	26·70[k]	26·78[k]	34·19[i]	35·15[i]	35·33[i]	33·81[i]	32·17[i]	30·48[i]
Labour force, million[l]	..	23·37	23·23	22·95	22·77	22·78	23·32	23·62	24·90	25·46	25·74	25·51	24·08	23·23
Numbers in work, million[m]	..	23·05	22·97	22·64	22·46	22·46	22·90	22·54	24·76	25·39	25·66	25·42	23·88	22·58
Real product per man-year	1351	1313	1313	1282	1258	1220	1166	1188	1380	1384	1376	1330	1347	1350
Hours per year[n]	2312	2292	2310	2292	2267	2265	2255	2300	2340	2400	2465	2455	2420	2420
Real product per man-hour	0·584	0·573	0·568	0·559	0·555	0·539	0·517	0·517	0·589	0·577	0·558	0·541	0·556	0·558

TABLE XXIII (*contd.*)

GREAT BRITAIN

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
Income at factor cost [d]	5037	4796	4560	4338	4061	3809	3522	3428	3560	3871	4098	4030	4058	3887
Income at market price [e]	5714	5384	5197	4955	4650	4369	4068	3969	4066	4372	4613	4567	4588	4398
I.U. per unit national currency [f]	..	5·40	5·68	5·83	5·94	5·94	6·04	5·88	5·80	5·69	5·27	5·23	5·16	5·06
Real income, I.U. billion	..	29·07	29·52	28·89	27·62	25·95	24·57	23·34	23·58	24·88	24·31	23·89	23·67	22·25
Real income, including imputation [b]	..	28·87	29·32	28·69	27·43	25·76	24·38	23·16	23·40	24·70	24·13	23·72	23·51	22·10
Real income per head population	..	624	637	627	602	567	539	513	521	553	543	535	532	502
Export surplus	..	−388	−431	−346	−275	−284	−258	−286	−406	−386	−382	−351	−386	−363
Net external income [p]	..	228	210	200	185	170	160	150	170	220	250	250	250	250
Sum of above in I.U. million	..	−865	−1256	−850	−534	−675	−591	−799	−1368	−944	−695	−528	−700	−571
Exports, I.U. million [o]	2060	2525	2820	2600	2565	2360	2225	2220	2215	2835	3395	3415	3285	2840
Imports, I.U. million [o]	5040	5560	5840	5500	5160	5090	4860	4820	5440	5350	5410	5160	5265	5170
Real product, I.U. million	28·34 [1]	26·70	27·56	26·64	25·37	23·70	22·34	21·36	21·54	23·14	22·81	22·50	22·23	20·34
Labour force, million [l]	22·18	21·86	21·75	21·64	21·52	21·41	21·29	21·18	21·06	20·89	20·72	20·55	20·38	20·21
Numbers in work, million [m]	20·91	20·07	20·27	19·89	19·48	19·25	18·77	18·41	18·43	18·97	19·50	19·30	19·24	18·77
Real product per man-year	1355	1330	1360	1314	1302	1230	1192	1160	1169	1221	1170	1166	1157	1085
Hours per year [n]	2335	2315	2360	2360	2355	2360	2360	2315	2242	2255	2265	2265	2265	2240
Real product per man-hour	0·580	0·574	0·575	0·556	0·554	0·521	0·505	0·501	0·520	0·541	0·516	0·515	0·523	0·485

[contd. overleaf

TABLE XXIII (*contd.*)

GREAT BRITAIN

	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912
Income at factor cost [d]	4091	3919	3844	3856	4460	5664	5461	4372	3631	3064	2591	2266	2368	2268
Income at market price [e]	4586	4405	4314	4352	5010	6214	5904	4657	3849	3294	2817	2450	2546	2435
I.U. per unit national currency [f]	4·96	4·93	9·49	4·69	3·72	3·24	4·12	4·59	5·40	6·50	7·62	9·11	8·94	9·21
Real income, I.U. billion	22·75	21·72	21·31	20·41	18·64	20·13	24·32	21·38	20·78	21·41	21·47	22·32	22·76	22·43
Real income, including imputation [b]	22·61	21·59	21·19	20·30	18·54	20·03	23·59	20·66	20·06	20·69	20·75	21·60	22·04	21·71
Real income per head population	516	494	490	472	434	470	553	487	474	490	491	514	530	526
Export surplus	−394	−336	−209	−179	−276	−376	−662	−784	−467	−343	−368	−171	−134	−146
Net external income [p]	250	220	200	175	150	200	200	200	200	200	250	250	248	205
Sum of above in I.U. million	−715	−572	−45	−19	−468	−570	−1910	−2680	−1441	−93	−899	720	1019	543
Exports, I.U. million [o]	3260	3275	3115	2790	2106	2818	2225	1428	2200	2800	2840	3295	3890	3795
Imports, I.U. million [o]	5020	4880	4360	3965	3445	3969	3940	3250	3145	3766	4410	4085	4525	4360
Real product, I.U. million	21·57	20·36	19·99	19·14	17·67	19·45	23·79	21·52	20·56	19·82	20·08	20·09	20·39	20·60
Labour force, million [l]	20·04	19·87	19·70	19·53	19·36	19·6	20·0	20·0	19·6	19·4	19·2	18·95	18·75	18·55
Numbers in work, million [m]	18·76	18·71	18·40	17·95	17·62	19·13	19·51	19·89	19·50	19·35	19·05	18·56	18·50	18·18
Real product per man-year	1150	1090	1086	1065	1006	1008	1221	1080	1053	1023	1054	1082	1102	1133
Hours per year [n]	2255	2255	2265	2220	2175	2280	2685	2785	2765	2745	2735	2728	2730	2731
Real product per man-hour	0·509	0·483	0·479	0·479	0·462	0·443	0·455	0·387	0·382	0·373	0·385	0·397	0·404	0·416

TABLE XXIII (*contd.*) GREAT BRITAIN

	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898
Income at factor cost [d]	2140	2063	1973	1926	2035	1939	1818	1742	1714	1738	1724	1756	1672	1601
Income at market price [e]	2305	2228	2122	2074	2184	2090	1971	1893	1861	1883	1860	1886	1795	1715
I.U. per unit national currency [f]	9·50	9·57	9·70	9·75	9·57	9·77	9·94	9·99	10·02	10·09	10·07	9·72	10·42	10·49
Real income, I.U. billion	21·90	21·32	20·58	20·22	20·90	20·42	19·59	18·91	18·65	19·00	18·73	18·33	18·70	17·99
Real income, including imputation [b]	21·18	20·62	19·89	19·54	20·23	19·76	18·94	18·27	18·02	18·38	18·13	17·74	18·12	17·42
Real income per head population	519	510	496	492	510	508	492	478	477	491	490	485	501	486
Export surplus	−124	−144	−155	−136	−128	−147	−157	−180	−182	−179	−174	−169	−155	−176
Net external income [p]	218	211	193	198	188	175	158	149	147	138	135	131	125	133
Sum of above in I.U. million	893	642	369	605	574	273	10	−310	−351	−415	−394	−369	−313	−451
Exports, I.U. million [o]	3600	3515	3266	3120	3420	3215	3020	2782	2750	2720	2595	2560	2706	2565
Imports, I.U. million [o]	4150	4053	3995	3863	4055	3980	3870	3818	3784	3785	3727	3640	3636	3617
Real product, I.U. million	19·74	19·44	18·79	18·19	19·02	18·72	18·08	17·54	17·34	17·73	17·39	17·03	17·50	16·82
Labour force, million [l]	18·35	18·15	17·95	17·74	17·54	17·33	17·13	16·92	16·72	16·51	16·31	16·12	15·94	15·76
Numbers in work, million [m]	18·01	17·63	17·14	16·93	17·15	16·94	16·61	16·31	16·24	16·11	15·98	15·86	15·70	15·49
Real product per man-year	1097	1102	1097	1072	1109	1103	1087	1077	1068	1101	1089	1073	1114	1087
Hours per year [n]	2732	2734	2762	2695	2697	2698	2699	2701	2702	2703	2714	2715	2717	2718
Real product per man-hour	0·402	0·403	0·397	0·398	0·411	0·409	0·403	0·399	0·395	0·406	0·401	0·396	0·411	0·400

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TABLE XXIII (*contd.*)

Great Britain

	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884
Income at factor cost [d]	1590	1470	1442	1377	1330	1361	1386	1399	1333	1246	1164	1135	1118	1136
Income at market price [e]	1703	1581	1549	1478	1428	1459	1481	1492	1425	1337	1255	1224	1207	1227
I.U. per unit national currency [f]	10·82	11·23	11·40	11·20	10·57	10·38	10·45	10·31	10·45	10·73	10·77	10·71	10·43	9·88
Real income, I.U. billion	18·43	17·75	17·66	16·55	15·09	15·14	15·48	15·38	14·89	14·35	13·52	13·11	12·59	12·12
Real income, including imputation [b]	17·87	17·20	17·12	16·02	14·57	14·63	14·97	14·87	14·39	13·85	13·03	12·62	12·10	11·63
Real income per head population	504	491	495	469	431	439	453	455	444	433	411	401	390	378
Export surplus	−157	−145	−131	−135	−128	−132	−126	−92	−112	−89	−81	−81	−100	−96
Net external income [p]	132	135	108	109	120	100	123	122	113	115	105	101	91	91
Sum of above in I.U. million	−271	−112	−263	−381	−85	−332	−31	309	10	279	259	214	−92	−49
Exports, I.U. million [o]	2555	2530	2482	2304	2268	2350	2360	2500	2505	2456	2346	2232	2133	2238
Imports, I.U. million [o]	3454	3368	3258	3100	2820	2922	2986	2820	2833	2600	2495	2381	2382	2353
Real product, I.U. million	17·24	16·47	16·60	15·61	14·10	14·39	14·37	14·23	14·05	13·43	12·62	12·26	11·94	11·56
Labour force, million [l]	15·58	15·40	15·22	15·04	14·86	14·68	14·50	14·32	14·15	13·97	13·80	13·62	13·45	13·27
Numbers in work, million [m]	15·27	15·09	14·74	14·47	14·32	14·17	14·21	14·14	13·98	13·69	13·32	12·96	12·91	12·84
Real product per man-year	1130	1091	1125	1079	986	1017	1014	1006	1005	983	948	947	927	901
Hours per year [n]	2719	2720	2722	2722	2723	2725	2726	2727	2729	2730	2731	2733	2734	2736
Real product per man-hour	0·415	0·401	0·412	0·395	0·362	0·373	0·372	0·368	0·367	0·359	0·347	0·346	0·339	0·329

TABLE XXIII (*contd.*)

GREAT BRITAIN

	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870
Income at factor cost [d]	1184	1156	1113	1073	1020	1071	1093	1088	1085	1133	1133	1041	987	929
Income at market price [e]	1274	1244	1200	1148	1101	1153	1174	1168	1164	1210	1210	1125	1057	996
I.U. per unit national currency [f]	9·44	9·37	9·34	9·08	9·64	9·25	8·83	8·70	8·54	8·33	7·69	7·92	8·50	8·76
Real income, I.U. billion	12·03	11·66	11·21	10·42	10·31	10·67	10·37	10·16	9·94	10·08	9·30	8·91	8·98	8·72
Real income, including imputation [b]	11·55	11·18	10·73	9·94	10·14	10·21	9·92	9·72	9·51	9·66	8·89	8·51	8·59	8·34
Real income per head population	380	371	362	337	349	357	350	347	344	355	331	322	330	325
Export surplus	−122	−106	−100	−125	−114	−123	−142	−118	−92	−72	−60	−40	−48	−59
Net external income [p]	88	82	88	110	101	92	83	73	63	62	60	69	57	54
Sum of above in I.U. million	−321	−225	−112	−135	−125	−287	−521	−392	−248	−83	0	230	−77	−44
Exports, I.U. million [o]	2226	2165	2115	1961	1709	1662	1638	1612	1640	1527	1602	1672	1678	1444
Imports, I.U. million [o]	2452	2315	2200	2262	2094	2043	2046	1963	1892	1823	1777	1700	1698	1491
Real product, I.U. million	11·65	11·25	10·76	9·77	9·88	10·12	10·03	9·76	9·51	9·45	8·72	8·25	8·65	8·43
Labour force, million [l]	13·09	12·92	12·74	12·57	12·39	12·22	12·04	11·86	11·68	11·51	11·33	11·16	10·98	10·80
Numbers in work, million [m]	12·88	12·72	12·46	12·21	11·73	11·84	11·77	11·67	11·56	11·42	11·26	11·09	10·85	10·57
Real product per man-year	904	885	864	800	841	854	852	837	823	827	776	744	798	798
Hours per year [n]	2738	2739	2740	2742	2743	2745	2746	2747	2768	2784	2787	2790	2823	2860
Real product per man-hour	0·330	0·323	0·315	0·292	0·306	0·311	0·310	0·305	0·297	0·297	0·278	0·267	0·283	0·279

[Notes overleaf

NOTES FOR TABLE XXIII

[a] Figures of income at factor cost and market prices include all Ireland up to 1919, Northern Ireland subsequently. Exclusion of Ireland is effected at the time when " imputation " for farm products is being made.

[b] Exclusion of Ireland is effected in this line.

[c] The official White Paper only gives gross income. Depreciation allowances, which had been rising at the rate of some £100 millions per annum, showed in 1952, owing to an administrative charge, a fall of £80 millions on 1951. The published figure of depreciation is therefore raised (provisionally) by £200 millions.

[d] In his article in *Economic Journal*, March 1948, Mr. A. R. Prest provided a patient and brilliant solution of a problem which had hitherto made it impossible to compute nineteenth-century British national income by individual years — namely, the income-tax law of " averaging " profits. Mr. Prest successfully " unscrambled " these averages to get good estimates of trading profits in individual years, from 1870 to 1914. He carried his estimate forward for 1919 on some approximate figures calculated by Professor A. J. Brown from bank clearings. (*Oxford Economic Papers*, No. 3, 1940.)

The main table uses some estimates by Mr. Richard Stone for the years 1920–24. From 1929 to 1937 we use data based on estimates published in *Economic Journal*, September 1938; for 1925–28 figures published in *National Income and Outlay* linked to the latter series on 1929. From 1938 onwards are used figures as published in succeeding White Papers.

[e] Conversion from factor cost to market prices was made in the White Papers and in the 1925–37 series mentioned above. For 1924 and earlier years, the conversion is made by adding to factor cost national income the proceeds of customs, excise, stamp taxes other than death duties, and Local Authority rates and water charges.

[f] A new series is started in 1946. Previous data based on 1938 or 1929. The pre-1913 data are all revalued on 1913 prices and a link between 1913 and 1929 is therefore necessary. For this purpose a link between 1913 and 1924 is first prepared using data originally published in *National Income and Outlay*, p. 235, but excluding exports and imports, as we wish to measure the internal purchasing power of the £. Prices in 1924 were 7 per cent higher than in 1929.

Up to 1929, indexes are constructed giving a weight of 0·75 to retail prices, 0·1 to services, 0·075 to building, and 0·075 to engineering. These are on a 1913 base up to 1919, and a 1929 base from 1920 to 1929. For retail prices Professor Bowley's series, given in *Wages and Income in the U.K. since 1860*, is used up to 1914. For the 1870s he gives only quinquennial data which have to be interpolated. From 1914 to 1929 Ministry of Labour data are used.

The price of services is assumed to fluctuate with wage-rates.

Building and engineering prices since 1920 are from the London and Cambridge Economic Service Special Memorandum of 1934, *Investment in Fixed Capital*. For earlier years are taken the series of building costs (pp. 268-9), and pig-iron prices (pp. 278-9) given in G. T. Jones's *Increasing Returns*. For pig-iron Jones's figures only go back to 1883 and are carried back to 1870 by Board of Trade indexes.

No price index need be calculated for the years 1930–37 because a separate estimate of real income is prepared in the article referred to in *Economic Journal* of September 1938.

CALCULATION OF PRICE INDEX FOR 1924 ON 1913 BASE

	1913 Output, £ million	1913 Output at 1924 Prices, £ million	1924 Output, £ million	1924 Output at 1913 Prices, £ million
Food	900	1530	1300	764
Rent and rates	240	352	300	204
Clothing	180	405	355	158
Fuel	120	223	200	108
Sundries	200	360	480	267
Drink and tobacco	200	500 *	420	168
Services (excluding distribution)	400	760	600	316
Iron and steel	150	214	275	192
Shipping	85	111	140	107
Building	150	330	300	136
TOTAL	2625	4785	4370	2420

1924 prices on 1913 base	1·822
1913 prices on 1924 base	0·553
Prices in 1924 on 1913 base (geometric mean)	1·815
Prices in 1929 on 1913 base	1·697
Value of 1913 £ in I.U.	8·94

* Figures from *Colwyn Report*

	1913	1923
Low-quality tobacco, oz.	3½d.	9d.
Whisky, 20-30 U.P., bottle	4s.	12s. 6d.
Beer, quality commonly sold, pint	2½d.	6d.
Port, bottle	2s. 3d.	4s. 6d.
Claret, bottle	1s. 6d.	3s.
Champagne, bottle (non-vintage)	4s. 6d.	9s.

[g] Deduced from 1950 by means of the following data from *National Income and Expenditure 1946–52*:

Consumption. Gross Investment and Public Authority Expenditure	1946	1947	1948	1949	1950	1951	1952
At current market prices	10,203	11,054	11,685	12,314	12,784	14,867	15,324
At 1948 market prices	11,772	11,810	11,685	11,982	12,008	12,680	12,328
Ratio	0·867	0·936	1·000	1·028	1·065	1·172	1·243

[i] For the war years an approximate revaluation was made, using as principal components the revaluations of consumption made in the White Papers, and a series estimating the real value of munitions production. The base for this latter series was 1943, using data given in *The Impact of the War on Civilian Consumption*, which compares the real volume of munitions production in U.S.A., Canada and Britain. British munitions production in that year can be estimated at one-quarter of that of the U.S.A., or $14 billions at current prices. This is equated to 9 billion

I.U. or £2150 millions.[1] The remainder of war-time national income (governmental expenditure other than munitions expenditure, and such internal investment and invisible exports as continued) is revalued on the basis of consumption prices.

For 1946–48, an alternative revaluation at 1938 prices can be made. This method shows net real income in 1948 to have been nearly 10 per cent higher than

	£ million at Current Prices				£ million at 1938 Prices		
	1938	1946	1947	1948	1946	1947	1948
Personal consumption expenditure *	4,335	6,886	7,622	8,204	4,372	4,512	4,514
Gross capital formation : †							
Buildings and works . .	590	865	1,030	1,165	405	430	455
Other fixed assets	230	535	665	755	298	353	345
Stocks and work in progress .	25	–165	140	200	–96	74	93
Sum of above .	5,180	8,121	9,457	10,324	4,979	5,369	5,407
Whole gross income at market price ‡	5,841	10,208	10,989	12,124	6,257	6,239	6,351
Stock of fixed capital at beginning of year . .	11,000	..	..	..	10,000	10,287	10,642
Depreciation .	457	..	..	..	416	428	443
Net income at market price . .	5,384	..	..	..	5,841	5,811	5,908
Real income bill. I.U. (linked on 1948) . .	28·05	..	..	..	30·50	30·30	30·80

* Cmd. 8203, Tables 15 and 16, the latter linked to 1938 through 1948 from data in Table 18.

† Cmd. 8203, Table 30 (1938 from Cmd. 7933, Table 10), and Professor Barna, *Royal Economic Society Memorandum*, No. 104. Revaluations to 1938 prices :

(i) Increase in stocks, by means of general wholesale price index.

(ii) Fixed capital other than buildings and works, by means of weighted index of export prices Classes III C-G inclusive.

(iii) Building and works, as follows. The Ministry of Health's Report on *The Cost of House Building* (1948) showed that between 1938 and 1947 costs rose 2·4-fold, whether for a 1938 or for a 1947 type house. Other years are linked to 1947 by an index giving two-thirds weight to building-material prices and one-third weight to *efficiency wages* in building. Changes in efficiency are interpolated from the *Girdwood Report* which shows that the number of man-hours required for a given structure was 1·45 times the 1938 level in 1947 and 1·26 times in 1949.

	1946	1947	1948	1949	1950
Building-material prices, 1938 base .	1·671	1·956	2·104	2·158	2·218
Average earnings in building and contracting, s. per week . . .	108·7	114·3	129·2	135·0	142·5
Do., at 1947 efficiency	108·7	114·3	120·1	117·4	116·3
Combined index on 1947 base, converted to 1938 base by factor 2·4 . .	2·13	2·4	2·56	2·59	2·63

‡ *National income and depreciation after deduction of stock appreciation* (Cmd. 8203, Table 6), plus "Indirect Taxes less Subsidies" (Cmd. 8203, Table 28). There is no satisfactory direct means of revaluing the current expenditure of Public Authorities and net invisible exports, and these components are therefore revalued on the sum of the revaluations of the other components.

[1] Professor A. J. Brown, in *Bulletin of International News*, 25th December 1943, estimates that at that date the £ would purchase as much munitions as \$6½.

in 1938, not slightly lower, as shown in the main table. Some may prefer to accept this result: but if they do so, they impugn either the O.E.E.C. valuation of the purchasing power of the £ in 1950, or the earlier valuation used for 1938.

Mr. C. F. Carter (London and Cambridge Economic Service, August 1951) constructed an index number of real national product, on a 1948 base, which he carried back to 1937 for which year he shows a real product 10–15 per cent below that of 1948, not approximately the same, as in the main table. However, his index number had an upward bias. It shows 1950 at 109 on the 1948 base, whereas the series now used shows only 106. If we discount bias at this rate back to 1937, we raise the 1937 result back to approximate equality with that for 1948.

In a period of rapidly rising prices financial allowances for depreciation are bound to be below true replacement costs, and net income is therefore over-stated. Special initial allowances for depreciation to some extent counteract this tendency, but in an approximate and uncertain way. The situation is best met by revaluing *gross product* (for the years up to 1938 net products have been used), and deducting from the result an estimate of the real burden of depreciation. The real burden of depreciation may be assumed to change proportionately to the real volume of the stock of fixed capital. This is not easy to estimate. The British Government submissions in the negotiations of the 1945 loan from the U.S.[1] estimate physical destruction on land at £860 millions at 1938 costs. Losses of shipping, including cargoes, and net internal dis-investment apart from physical destruction, were put at £700 millions and £900 millions respectively *at* 1945 *prices*. Mr. P. S. Brown (*American Economic Review*, September 1946), commenting on these estimates, points out that a considerable amount of the shipping losses were replaced during the course of the war, and that a large but uncertain proportion of war-time structures and stores would have some peace-time use. The available data make it very hard to estimate how much of the net internal de-cumulation during the war represented reduction of stocks, and how much represented failure to maintain or replace fixed capital. Excluding all stocks, consumers' capital, such as cars and furniture, and certain public assets such as roads and military equipment, the best estimate which can be made at present makes the value of fixed capital (including houses) £11,000 millions in 1938 and at £10,000 millions, at 1938 prices, at the beginning of 1946. These figures are used in the table; for succeeding years additions are made from the current real net value of output of capital goods.

[k] Of the figures for the years 1946–52, only 1950 is obtained from real income, exports, imports, etc., given above. With this as base, all the other years are deduced from the index of real gross expenditure in *National Income and Expenditure 1946–52*, p. viii. *Economic Survey for 1954* shows that gross product, at 1952 factor prices, was in 1953 £500 millions, or 3·7 per cent above 1952.

[l] "Working population" is now defined as persons "who work for pay or gain or register themselves as available for such work" (including the Armed Forces).

For the early years Census data are used. A series on a comparable basis throughout is published in the *Statistical Abstract for the U.K.*, 81st No., p. xv. For 1938 is used Professor Barna's estimate (*Royal Economic Society Memorandum No. 104*), with the exclusion of Northern Ireland.

Comprehensive annual figures of working population have been published since 1948. For the years 1938 to 1947 the official series omitted people over pensionable age, and domestic servants. The 1938 to 1947 figures need to be raised on this account; the correction is highly conjectural. We know the number of employed pensioners rose, and of domestic servants fell during these years, but the orders of magnitude are very difficult to estimate.

For all other years linear interpolations used except for the period 1914–20. Here again we have to estimate the order of magnitude of the additional numbers

[1] See *Economist*, 15th December 1945.

brought into the working population, but it appears that it was very much less than in the Second World War.

[m] For unemployment the official records are used without alteration back to 1922. For 1921 and earlier years, the Trade Union unemployment percentages are used. As is well known, this series overweights the engineering and metal trades, which are subject to greater fluctuation than industry in general. The series is first re-weighted to give those trades their appropriate weight of approximately one-quarter. This corrected series is then multiplied by a factor of 0·63 and applied to the whole working population. This coefficient is estimated from the years 1922–25, for which we have an overlap of the Trade Union series and the full official unemployment records. A result of this order of magnitude is to be expected; there is generally little or no unemployment among employers and working proprietors, salaried workers, agricultural workers, and certain other large groups of manual workers, including railwaymen and Government employees.

[n] Up to 1920, estimates of average hours are from the unweighted average of textile, building, mining and engineering hours given by Professor Bowley, and agricultural hours given by Professor Ashby.[1] This agrees closely with a general estimate of 55 hours for 1886 given by Sir Robert Giffen (who contrasted it favourably with the average of 66 hours which he estimated to have prevailed fifty years earlier). Official inquiries into hours in industry are available for each year since 1938, 1935, 1931 and 1924. Interpolation is uncertain; some measure of short time prevailed in depression years. But even in 1931, averaged over all workers, this only amounted to 1·6 hours.

[o] International trade plays such a large part in the British economy that it is deemed desirable, for every year from 1870 onwards, to revalue imports and exports separately from the rest of national income. From the money value of national income we deduct exports (f.o.b.) and then add value of imports (c.i.f.). This gives us the money value of international consumption and investment. By use of appropriate indices of the internal purchasing power of the £ we express this internal consumption and investment in I.U. We then add back the I.U. value of exports and deduct the I.U. value of imports. In this way we get a genuine measure of British productivity, which is quite unaffected by changes in the terms of trade, however violent. Any other method of measurement is liable to some distortion by changes in the terms of trade.

We are fortunate in having a long-period series of import and export revaluations prepared by Dr. Schlote, *Entwicklung und Strukturwandlungen des englischen Aussenhandels von 1700 bis zur Gegenwart*. On p. 134 he gives revaluations, at 1913 prices, of the quantity of imports and exports from 1870 to 1933 (actually his data go back to 1694). By applying the factors quoted above we can convert all his results to I.U.

To carry his series on to 1938 use is made of a table prepared in League of Nations *Review of World Trade*, 1938, p. 79. This table links together diverse British official calculations on the volume of imports and exports originally prepared in shorter series. The League of Nations series is linked to Dr. Schlote on 1932–33 on imports, and on the median of the years 1923–33 for exports.

Both Dr. Schlote and the League of Nations figures refer to "General Trade", i.e. re-exports are included with both exports and imports. For 1939 and subsequent years re-exports are excluded on both sides. As we are mainly concerned with the difference between the volumes of imports and exports, this will not appreciably affect our results. But it makes a small break in the continuity of the import and export series in 1939.

For 1939 and subsequent years are used the new British Official Series calculating volumes of imports and exports, linked in the first instance on 1938. The

[1] *Proceedings of the Royal Institute*, 1942.

basis of weighting was later changed to prices of 1947, which latter basis has been used for 1947 and subsequent years and also for the link between 1947 and 1938.

[p] To measure British productivity we require " home-produced income ", i.e. exclusive of the earnings of British capital abroad. Up to 1913 we use the data provided by C. K. Hobson in *The Export of Capital*, with some interpolation in the 1870s. From 1920 to 1937 we have the data currently published by the Board of Trade in its *Balance of Payments Estimates* (interpolating for 1921). For 1914 to 1919 the figures are conjectural.

TABLE XXIV

Greece (billion drachmai)

	1952	1951	1950	1949	1948	1947	1946	1945	1942	1939	1938	1937
Income at factor cost [a]	..	..	..	19,146	14,529	9206	6231	655	..	67·2	67·4	67·7
Income at market price	..	..	..	..	..	..	..	..	..	78·1	78·3	78·2
I.U. per unit national currency [c]	..	..	..	..	..	..	..	..	..	0·0162	0·0162	0·0160
Real income, I.U. [b]	..	..	..	1018	911	864	647	399	719	1268	1271	1252
Real income, including imputation	..	..	..	1143	1033	984	762	509	859	1409	1411	1391
Real income per head population	172 [f]	181 [f]	162 [f]	146	133	131	103	70	117	197	200	200
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	..	..	..	..	..	0·6	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	1143	1033	984	762	509	859	1399	1401	1391
Labour force, million	..	..	..	2·89	2·85	2·77	2·73	2·70	2·70	2·64	2·60	2·57
Numbers in work [d]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	..	..	..	396	363	355	279	188	318	529	539	541
Hours per year [e]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	0·158	0·145	0·142	0·112	0·075	0·127	0·212	0·216	0·216

[a] 1945–49, High Board of Reconstruction.
1927–39, Prof. Evelpidi 1938.
1913, Dresdner Bank, *Wirtschaftliche Kräfte der Welt.*
1891, Skiadis.

[b] 1945–49, deduced from 1937 base from real income in 1938 drachmai shown by High Board of Reconstruction.
1942, deduced from 1937 base from real income in 1938 drachmai shown by Prof. Evelpidi.

[*Notes contd. below*

TABLE XXIV (*contd.*)

GREECE

	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1913	1891
Income at factor cost [a]	59·4	55·0	52·5	49·1	43·7	39·4	42·7	44·5	46·1	44·1	1·5	0·67
Income at market price	69·4	61·9	58·8	55·3	50·6	47·7	51·3	59·5	54·1	50·9	1·8	0·80
I.U. per unit national currency [c]	0·0172	0·0178	0·0180	0·0184	0·0198	0·0211	0·0209	0·0183	0·0189	0·0197	0·352	0·396
Real income, I.U. [b]	1193	1103	1059	1018	1003	1009	1072	1088	1022	1002	634	317
Real income, including imputation	1331	1240	1195	1153	1137	1140	1201	1215	1147	1125	717	364
Real income per head population	193	183	179	175	174	177	189	193	185	187	149	162
Export surplus	..	..	..						..	..	..	..
Net external income	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	−2·0	−0·5	−1·8	−1·4	−1·2	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	1340	1258	1222	1190	1147	1178	1230	1237	1167	1145	727	369
Labour force, million	2·54	2·50	2·46	2·43	2·40	2·37	2·34	2·31	2·28	2·22	1·61	0·75
Numbers in work [d]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	527	503	496	489	478	496	526	535	511	516	452	492
Hours per year [e]	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	0·211	0·201	0·198	0·196	0·191	0·198	0·210	0·214	0·204	0·206	0·151	0·164

[c] Based on 1935 comparison of purchasing power with the French franc given by the Comité Hellénique de la Chambre de Commerce Internationale. 1891 prices calculated from 1913 by use of British import price trend.

[d] No allowance made for unemployment. A great deal of unemployment and disguised unemployment is known to prevail.

[e] Assumed at 3000 to 1913, then 2500.

[f] Carried forward from 1948 on data given in *U.N. Monthly Bulletin of Statistics*, December 1953.

TABLE XXV

HUNGARY (billion forint, pengö or kronen)

(Years beginning 1st July)

	1947–48	1946–47	1945–46	1943–44	1942–43	1941–42	1940–41[b]	1939–40[b]	1938–39[b]	1936–37	1935–36	1934–35
Income at factor cost[c]	..	11·82	..	15·43	10·35	8·31	6·73	5·94	5·19	..	..	..
Income at market price[d]	..	..	..	..	..	..	..	..	6·72	5·35	4·91	4·57
I.U. per unit national currency	..	..	..	..	..	..	..	..	0·195	..	..	..
Real income, I.U. million	..	..	..	..	..	..	..	..	1314	..	..	..
Real income, including imputation[e]	1271	922	716	1470	1541	1458	1498	1550	1462	1444	1332	1248
Real income per head population	139	102	79	155	164	156	161	168	159	159	148	140
Export surplus	..	..	..	..	..	..	..	..	0·13	0·10	0·03	0·06
Net external income	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	144	161	140	124
Imports, I.U. million	..	..	..	..	..	..	..	..	123	141	133	117
Real product, I.U. million	1271	922	716	1470	1541	1458	1498	1551	1458	1445	1339	1242
Labour force, million	3·53	3·50	3·49	3·65	3·64	3·63	3·60	3·58	3·54	3·50	3·48	3·46
Numbers in work, million[f]	3·50	3·47	3·46	3·61	3·60	3·59	3·56	3·54	3·44	3·40	3·38	3·36
Real product per man-year	363	266	207	406	427	405	421	439	423	425	396	370
Hours per year[i]	2575	2575	2575	2575	2575	2575	2575	2575	2473	2520	2536	2248
Real product per man-hour	0·141	0·103	0·080	0·158	0·166	0·157	0·164	0·171	0·171	0·169	0·156	0·164

TABLE XXV (*contd.*)

HUNGARY

	1933–34	1932–33	1931–32	1930–31	1929–30	1928–29	1927–28	1926–27	1925–26	1924–25	1911–13[g]	1911–13[h]
Income at factor cost [c]	..	..	..	..	..	..	..	..	..	..	3·14	7·92
Income at market price [a]	4·45	4·52	4·91	5·59	6·26	6·68	6·36	6·33	5·89	5·25	3·3	8·3
I.U. per unit national currency	..	..	..	..	..	0·1655 [d]	..	..	..	..	0·230	0·230
Real income, I.U. million	..	..	..	..	..	1107	..	..	..	..	760	1910
Real income, including imputation [e]	1221	1084	1100	1151	1240	1232	1178	1150	1132	999	861	2206
Real income per head population	138	123	126	132	144	144	139	137	136	121	110	85
Export surplus	0·08	0·03	0·06	0·01	0·07	−0·33	−0·39	−0·19	−0·02	−0·08	..	..
Net external income	..	−0·05	−0·12	−0·20	−0·17	−0·15	−0·12	−0·10	−0·07	−0·05	..	−0·3
Sum of above in I.U. million	..	..	..	..	..	−79	..	..	..	..	..	..
Exports, I.U. million	125	107	105	145	169	143	117	132	143	124	..	..
Imports, I.U. million	100	85	95	130	165	186	195	174	134	123	..	..
Real product, I.U. million	1228	1110	1137	1202	1258	1268	1188	1161	1158	1022	911	2276
Labour force, million	3·44	3·42	3·39	3·36	3·32	3·28	3·25	3·22	3·17	3·13	3·21	8·3
Numbers in work, million [f]	3·33	3·29	3·27	3·26	3·24	3·22	3·19	3·14	3·05	3·01	3·15	8·2
Real product per man-year	368	337	347	368	388	393	372	370	380	339	289	278
Hours per year [i]	2229	2210	2211	2235	2411	2574	2565	2550	2575	2575	3000	3000
Real product per man-hour	0·165	0·152	0·157	0·165	0·161	0·153	0·145	0·145	0·148	0·132	0·096	0·093

[Notes overleaf

NOTES FOR TABLE XXV

[a] Matolcsy-Varga estimates (*National Income of Hungary*) brought up to date in *Bulletin of the Hungarian Institute of Economic Research*, March 1947. Includes paid but not unpaid domestic work. Additions made for public services as follows :

	1924–25	1925–26	1926–27	1927–28	1928–29
Billion pengö .	0·91	1·02	1·15	1·23	1·27

	1929–30	1930–31	1931–32	1932–33	1933–34
Billion pengö .	1·22	1·27	1·23	1·05	1·08

	1934–35	1935–36	1936–37
Billion pengö .	1·08	1·11	1·15

[b] Boundary changes occurred in these years. However, the national income figures and the per head figures refer throughout to the pre-1938 territory. A report of the Konjunktur-institutet indicates that in 1942–43 the annexed territories added a national income only 20 per cent of that shown above for the old territory, but a 56 per cent population addition.

[c] From 1938–39, income at market price before addition for public services.

[d] The average purchasing power of the pengö was 0·169 I.U. in 1929, which may be put at 0·1655 for 1928–29. This is used to deduce real income in 1928–29, from which is deduced real product for that year, which then is used as a base for Matolcsy and Varga's " volume " series (p. 68) up to 1936–37.

[e] 1924–25 to 1936–37, deduced from real product and other figures given below. From 1938–39, from a real income series given by Dr. Dereksen (paper to Econometric Society, 28th December 1948) : U.N. Statistical Paper H.2 for last two years.

[f] Official figures since 1930 assumed to represent half actual unemployment. Earlier years from Trade Union percentages.

[g] Post-1919 territory.

[h] Contemporary territory : De Fellner's estimates (*Metron*, 1923) raised by 18 per cent to allow for excluded services (from ratio found for Austria) : expressed in kronen. These results are not at all compatible with those of Professor Hertz in *Economic Problems of the Danubian States*. Beginning with Kaizl's estimate of 6 billion kronen for 1890, he estimates 7·8 billions for 1901–3 and 14·8 for 1911–13 (factor cost). This latter gives Hungary a money income per head only 8 per cent below Austria, and a real income per head actually higher than Austria. All the indications are against this conclusion.

[i] Hungary has shown considerable part-time working among rural workers (see *International Labour Review*, vol. 25, p. 673, and vol. 28, p. 525). It is assumed that half the labour force work factory hours and the other half 3000 hours per year in 1911–13, 1800 hours 1930–31 to 1934–35 inclusive, and 2400 hours for the rest of the period.

TABLE XXVI

IRELAND (£ million)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Income at factor cost [a]	357·9	340·1	341·2	321·1	288·1	277·9	267·7	248·0	228·7	207·6	191·2	177·0
Income at market price	398·9	380·9	378·6	353·1	318·8	307	294	272·2	253·9	232·5	217·3	203·2
I.U. per unit national currency [c]	3·07	3·31	3·35	3·37	3·45	3·666	3·63	3·63	3·79	3·89	4·30	4·73
Real income, I.U. million	1228	1263	1270	1192	1102	1127	1068	989	963	905	934	962
Real income, including imputation [d]	1275	1310	1317	1239	1149	1177	1121	1045	1020	963	977	1005
Real income per head population	431	441	442	413	386	398	380	355	346	325	327	340
Export surplus	−123·1	−87·0	−69·6	−87·0	−91·8	−33·1	−5·4	1·4	1·4	−2·0	2·3	−13·8
Net external income [b]	9·0	8·9	8·9	10·2	8·8	8·6	..	11·1	9·8	7·9	7·8	9·6
Sum of above in I.U. million	−350	−259	−206	−259	−286	−91	17	45	42	23	43	−20
Exports, I.U. million	117	118	105	87	82	87	83	69	66	85	92	113
Imports, I.U. million	317	304	271	271	263	171	95	66	63	85	88	171
Real product, I.U. million	1425	1383	1357	1314	1254	1184	1092	1003	981	940	938	967
Labour force, '000	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, '000 [e]	1450	1447	1415	1437	1385	1335	1226	1213	1213	1220	1238	1230
Real product per man-year	984	956	960	914	906	887	890	827	809	770	758	786
Hours per year	2210	2250	2245	2230	2230	2235	2220	2180	2165	2155	2175	2220
Real product per man-hour	0·444	0·424	0·426	0·409	0·405	0·397	0·401	0·379	0·373	0·357	0·348	0·354

[a] Excludes emigrants' remittances and with allowance for farm inventory charges. Official figures from 1938, 1926–37, Professor Duncan's paper to *Statistical and Social Inquiry Society of Ireland*, 26th October 1939.

[b] Excludes emigrants' remittances.

[c] From 1943, on 1946 base adjusted by Cost of Living Index. 1926–42 on 1929 base, adjusted by Professor Duncan's index (*loc. cit.* p. 10, and *Evidence to Banking Commission*, 1938).

[d] Actual data for 1938–44 from White Paper — extrapolated for other years.

[*Table and Notes contd. overleaf*

TABLE XXVI (*contd.*)

IRELAND

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1929	1926	1911 [f]	1883 [g]
Income at factor cost [a]	161·3	154·1	150	150	146·3	141·0	136·6	141·0	146·3	156·2	152	76	80
Income at market price	186·3	176·2	171	171	167·3	159·9	156·2	159·9	165·6	176·0	166	82	86
I.U. per unit national currency [c]	5·45	5·64	5·70	5·96	6·16	6·25	6·25	6·08	5·96	5·19	5·04	9·85	9·76
Real income, I.U. million	1017	995	976	1022	1033	1000	976	972	988	913	837	807	839
Real income, including imputation [d]	1063	1042	1023	1069	1080	1047	1023	1019	1035	960	884	897	919
Real income per head population	362	356	347	360	363	352	345	344	350	326	297	290	182
Export surplus	−16·5	−17·2	−21·3	−17·4	−17·4	−21·2	−16·8	−16·2	−15·2	−13·4	−19·3	..	..
Net external income [b]	9·0	6·3	..	..	10·4	11·7	11·5	12·3	5·8	6·8	..	..	..
Sum of above in I.U. million	−41	−62	−78	−50	−43	−59	−33	−24	−56	−34	−60	..	..
Exports, I.U. million	118	118	128	142	137	124	123	138	169	189	158	..	..
Imports, I.U. million	223	213	224	228	223	236	217	238	277	262	237	..	..
Real product, I.U. million	999	1009	1005	1033	1037	994	962	943	983	921	865	922	969
Labour force, '000	..	..	..	..	..	..	..	..	..	..	..	1310	2300
Numbers in work, '000 [e]	1228	1233	1250	1235	1238	1229	1224	1208	1222	1209	1220	1290	2200
Real product per man-year	814	816	804	836	837	808	785	781	804	762	709	715	440
Hours per year	2230	2210	2220	2225	2230	2240	2240	2240	2240	2250	2260	2670	2750
Real product per man-hour	0·365	0·369	0·362	0·376	0·375	0·361	0·350	0·348	0·358	0·338	0·314	0·268	0·160

[e] From 1934 to 1944 persons insured under Health Insurance Acts at work, plus males engaged in agriculture, plus 280,000 (which equates the result for 1936 to Census occupied population, less unemployed). For earlier years, occupied population interpolated between 1926 and 1936 Census results, taking into account fluctuations in net migration, less unemployed. Since 1944, general index of employment.

[f] Bowley and Stamp, *The National Income 1924*, excludes the six northern counties.

[g] Sir Robert Giffen's *Economic Enquiries and Studies* puts Irish income at this date at £80 millions (for the whole of Ireland including the six northern counties).

TABLE XXVII

ITALY (billion lire)

N.B.—Add 5 per cent to convert to O.E.E.C. definition (Italian Economic Survey, March-June 1954)

	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941
*Net product factor cost [a]	8467	7826	7529	6591	6030	5645	4954	2502	1534	858	246	175	159
*Net product market prices [a]	9928	9202	8786	7648	6948	6387	5420	2719	1633	892	276	205	185
*Net income market prices	9953	9221	8799	7660	6961	6399	5430	2724	1636	894	276	205	185
I.U. per unit national currency [b]	0·00119	0·00122	0·00126	0·00139	0·00137	0·00139	0·00147	0·00240	0·00282	0·00555	0·192	0·0323	0·373
Real income, I.U. billion	11·84	11·25	11·09	10·65	9·54	8·89	7·98	6·54	4·61	4·96	5·30	6·62	6·90
Real income, including imputation	12·45	11·86	11·70	11·26	10·15	9·50	8·59	7·15	5·22	5·57	5·91	7·23	7·51
Real income per head population	265	253	250	243	221	208	186	156	114	122	130	160	167
Export surplus	−567	−593	−329	−151	−232	−277	−596	..	..	..	..	..	..
Net external income	25	19	13	12	13	..	..	..	..	..	..	..	..
Sum of above in I.U. million	−645	−700	−398	−193	−300	−372	−875	..	..	..	..	..	..
Exports, I.U. million [f]	990	879	1000	843	685	580	342	..	..	..	..	..	..
Imports, I.U. million [f]	1004	889	810	656	623	566	515	..	..	..	..	..	..
Real product, I.U. billion	13·08	12·55	12·29	11·64	10·51	9·89	9·29	7·50	5·22	5·57	5·91	7·23	7·51
Labour force, million [c]	17·69	17·61	17·53	17·45	17·37	17·30	17·22	17·14	17·06	16·99	16·91	16·83	16·75
Numbers in work, million [d]	15·92	15·93	15·99	16·02	15·88	15·78	16·6	17·0	17·0	16·9	16·8	16·7	16·7
*Average product per man-year	822	788	769	727	662	627	560	441	307	330	352	433	450
*Average hours [e]	2032	2015	2015	1992	1992	1987	2000	2000	2000	2000	2000	1995	1990
*Average product per man-hour	0·405	0·391	0·382	0·365	0·332	0·316	0·280	0·220	0·153	0·165	0·176	0·217	0·226

[contd. overleaf

TABLE XXVII (*contd.*)

ITALY

	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
*Net product factor cost [a] .	146	128·1	117·2	111·2	91·9	90·1	80·4	81·7	90·2	88·4	104·7	122·9	119·7
*Net product market prices [a] .	169	149·3	135·6	127·7	106·9	104·2	94·3	95·5	103·9	102·8	118·9	136·8	133·8
*Net income market prices .	169	149·1	135·4	127·5	106·6	103·9	94·0	95·1	103·5	101·9	117·9	135·8	132·8
I.U. per unit national currency [b]	0·0432	0·0505	0·0526	0·0566	0·0620	0·0667	0·0677	0·0641	0·0604	0·0588	0·0530	0·0514	0·0522
Real income, I.U. billion .	7·30	7·53	7·12	7·22	6·61	6·93	6·36	6·10	6·25	5·99	6·25	6·98	6·93
Real income, including imputation	7·91	8·14	7·73	7·85	7·20	7·57	6·96	6·68	6·86	6·59	6·87	7·68	7·62
Real income per head population	178	185	177	181	168	177	165	159	165	160	169	189	190
Export surplus . . .	..	..	−0·76	−3·55	−0,46	−2·84	−2·56	−1·62	−1·51	−1·54	−5·37	−6·55	−7·41
Net external income . .	..	..	−0·16	..	..	..	..	..	−0·44	−0·90	−0·98	−1·00	−0·98
Sum of above in I.U. million .	..	..	−48	−212	−45	−210	−197	−130	−118	−143	−336	−388	−439
Exports, I.U. million [f] . .	..	..	692	714	479	..	512	527	537	690	643	679	615
Imports, I.U. million [f] . .	..	..	543	646	436	..	706	627	657	837	853	922	931
Real product, I.U. billion .	7·91	8·14	7·63	7·99	7·20	7·57	6·97	6·71	6·86	6·59	7·00	7·82	7·84
Labour force, million [c] . .	16·68	16·60	16·52	16·44	16·37	16·21	16·06	15·91	15·76	15·61	15·55	15·49	15·43
Numbers in work, million [d] .	16·5	16·3	16·17	15·94	15·72	15·36	15·10	14·89	14·75	14·88	15·12	15·19	15·11
*Average product per man-year	479	499	472	501	458	493	462	451	465	443	463	515	519
*Average hours [e] . . .	1942	1905	1910	1966	1850	1840	2062	2086	2025	2050	2100	2180	2160
*Average product per man-hour	0·246	0·262	0·247	0·255	0·248	0·268	0·224	0·216	0·229	0·216	0·220	0·236	0·240

TABLE XXVII (*contd.*) ITALY

	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915
*Net product factor cost [a]	120·3	144·5	132·9	111·9	104·9	90·4	83·0	82·1	57·5	54·7	39·4	28·3	20·20
*Net product market prices [a]	134·9	159·4	146·8	124·3	116·3	100·9	91·9	88·8	62·3	58·5	42·4	30·6	21·96
*Net income market prices	134·6	159·3	146·7	124·2	116·2	100·8	91·8	88·7	62·3	58·5	42·4	30·6	21·91
I.U. per unit national currency [b]	0·0484	0·0442	0·0478	0·0537	0·0555	0·0552	0·0548	0·0650	0·0854	0·0866	0·121	0·171	0·214
Real income, I.U. billion	6·51	7·04	7·01	6·67	6·45	5·56	5·03	5·77	5·32	5·07	5·13	5·23	4·69
Real income, including imputation	7·16	7·74	7·71	7·34	7·10	6·12	5·53	6·35	5·83	5·58	5·64	5·75	5·16
Real income per head population	179	196	197	189	184	160	146	177	163	155	154	157	142
Export surplus	−4·94	−7·50	−8·23	−5·19	−6·38	−6·75	−8·99	..	..	..	..	..	..
Net external income	−0·35	−0·05	−0·15	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	−256	−334	−400	−286	−360	−377	−495	..	..	..	..	..	..
Exports, I.U. million [f]	605	580	635	550	416	367	366	..	..	..	..	..	..
Imports, I.U. million [f]	795	813	823	715	651	576	674	..	..	..	..	..	..
Real product, I.U. billion	7·23	7·84	7·92	7·46	7·22	6·29	5·72	6·55	5·83	5·58	5·64	5·75	5·10
Labour force, million [c]	15·37	15·31	15·25	15·19	15·13	15·07	15·01	14·80	14·60	14·39	14·19	13·98	13·77
Numbers in work, million [d]	15·09	15·20	15·14	15·03	14·88	14·66	14·60	14·7	14·5	14·3	14·1	13·9	13·7
*Average product per man-year	479	516	523	496	485	429	392	445	402	390	400	414	372
*Average hours [e]	2200	2200	2200	2200	2200	2200	2200	2200	2200	2500	2800	2800	2800
*Average product per man-hour	0·216	0·234	0·237	0·225	0·220	0·195	0·188	0·202	0·183	0·156	0·143	0·148	0·133

[*contd. overleaf*

TABLE XXVII (*contd.*)

ITALY

	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901
*Net product factor cost [a]	19·93	20·90	19·60	19·26	16·94	18·10	15·64	17·72	13·55	13·61	13·31	14·11	12·16	13·91
*Net product market prices [a]	21·55	22·61	21·28	20·86	18·47	19·53	16·97	19·01	14·85	14·83	14·45	15·24	13·28	15·01
*Net income market prices [a]	21·51	22·57	21·24	20·82	18·43	19·49	16·93	18·97	14·82	14·80	14·42	15·21	13·25	14·98
I.U. per unit national currency [b]	0·229	0·229	0·229	0·232	0·236	0·244	0·236	0·234	0·246	0·249	0·252	0·254	0·260	0·260
Real income, I.U. billion	4·93	5·17	4·86	4·83	4·35	4·76	4·00	4·44	3·65	3·69	3·63	3·86	3·45	3·89
Real income, including imputation	5·42	5·69	5·36	5·33	4·80	5·26	4·42	4·91	4·04	4·10	4·03	4·29	3·86	4·31
Real income per head population	152	162	153	154	140	154	131	147	121	124	122	130	118	132
Export surplus	−0·73	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	−0·04	..	..	..	..	..	..	..	..	..	..	..	..	..
Sum of above in I.U. million	−174	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million [f]	464	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million [f]	703	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. billion	5·36	5·63	5·30	5·27	4·74	5·20	4·36	4·85	3·98	4·04	3·97	4·23	3·80	4·25
Labour force, million [c]	13·56	13·50	13·44	13·38	13·32	13·26	13·20	13·14	13·08	13·02	12·96	12·90	12·84	12·78
Numbers in work, million [d]	13·5	13·4	13·3	13·3	13·2	13·2	13·1	13·0	13·0	12·9	12·9	12·8	12·7	12·7
*Average product per man-year	397	420	398	397	360	394	333	373	306	313	308	330	299	335
*Average hours [e]	2800	2800	2900	2900	2900	3000	3000	3000	3100	3100	3100	3200	3200	3200
*Average product per man-hour	0·142	0·150	0·137	0·137	0·124	0·131	0·111	0·124	0·099	0·101	0·099	0·103	0·093	0·105

NOTES FOR TABLE XXVII

* The form in which the official Italian statistics have been presented. It is necessary to make these slight changes in definitions.

[a] From *Annuario Statistico Italiano*, 1952, p. 493, and more recent issues.

[b] Up to 1943 linked to purchasing power of 1929, subsequently to Dr. Gilbert's figure for 1950, on cost of living data on 1913 and 1938 bases respectively given in *Annuario*, 1952, p. 476, and subsequent issues.

[c] Census data, excluding females in agriculture, interpolated.

[d] Since 1949, from official estimates of percentage of labour force unemployed. From 1924–48 (excluding war years) official statistics of numbers of unemployed registered. Other years arbitrary deduction.

[e] Information on hours has been published, since 1947, in *International Labour Review*, in the form of average number of hours per day. These are multiplied by a factor of 250. From 1929 to 1938 statistics of the Ministry of Corporations were used ; for 1924-28 the 1929 hours were assumed to prevail. For earlier years the only available information is that given in *Abstract of Foreign Labour Statistics* (10 per day in 1907), and by Jeans in *England's Supremacy* at 76 per week in 1885. 1953 from *Italian Economic Survey*, March-June 1954.

[f] Based on exports and imports of 1927, in which year the lire is equated to 0·0387 I.U. for exports and 0·0390 I.U. for imports ; computed from the ratio of export and import prices in that year to the average of such prices (expressed in $) over the decade 1925–34.

TABLE XXVIII

JAPAN (billion yen)

	1952	1951	1950	1949	1948	1947	1946
Income at factor cost [a]	..	4564	3230	2902	1921	917	300
Income at market price [b]	..	5098	..	3171	2110	..	..
I.U. per unit national currency [c]	..	..	..	..	..	..	..
Real income, I.U. million [d]	18·1	16·7	15·1	14·3	12·5	10·8	8·9
Real income, including imputation	19·1	17·7	16·1	15·3	13·5	11·8	9·9
Real income per head population	220	210	194	188	170	151	132
Export surplus	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..	..
Labour force, million [e]	..	..	..	..	..	25·1	24·2
Numbers in work, million [f]	28·8	27·8	27·3	27·8	26·2	24·1	22·6
Real product per man-year	663	636	589	550	515	490	438
Hours per year [g]	2235	2220	2170	2100	2100	2100	..
Real product per man-hour	0·297	0·286	0·271	0·262	0·245	0·234	0·209

	1934	1933	1932	1931	1930	1929
Income at factor cost [a]	12·3	11·3	10·7	10·3	10·7	..
Income at market price [b]	13·0	11·9	11·3	10·9	11·35	13·2
I.U. per unit national currency [c]	1·025	1·035	1·115	1·053	0·985	0·985
Real income, I.U. million [d]	13·3	12·3	12·6	11·47	11·18	13·00
Real income, including imputation	14·2	13·3	13·6	12·5	12·2	14·0
Real income per head population	210	199	206	191	189	223
Export surplus	..	..	..	..	..	..
Net external income	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..
Labour force, million [e]	23·9	23·6	23·4	23·1	22·8	22·3
Numbers in work, mililon [f]	23·5	23·2	22·9	22·7	22·4	22·0
Real product per man-year	604	574	593	550	545	636
Hours per year [g]	2990	2980	2896	2880	2902	2998
Real product per man-hour	0·202	0·193	0·205	0·191	0·188	0·212

1944	1943	1942	1941	1940	1939	1938	1937	1936	1935
46·0	41·6	35·4	30·8	27·2	23·8	19·0	16·8	14·6	13·5
..	..	37·75	32·3	28·5	25·1	20·3	18·1	15·6	14·3
..	..	..	..	0·592	0·679	0·745	0·821	0·939	0·985
..	..	..	..	16·9	16·4	15·3	14·8	14·6	14·1
..	..	..	..	17·8	17·3	16·2	15·7	15·5	15·0
..	..	..	..	249	244	229	224	223	218
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	25·6	25·5	25·1	24·8	24·4	24·1
..	..	..	..	25·5	25·3	24·9	24·5	24·1	23·7
..	..	..	..	698	683	650	640	643	633
..	..	..	..	3130	3095	3040	3030	3005	2998
..	..	..	..	0·223	0·220	0·214	0·211	0·214	0·211

1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1913
..	..	..	..	..	..	..	..	..	..	4·8 [a]
13·8	13·4	13·5	13·9	13·2	12·9	12·8	11·1	9·4	8·8	5·0
0·788	0·794	0·753	0·668	0·652	0·678	0·687	0·674	0·519	0·572	1·425
10·87	10·62	10·16	9·29	8·61	8·75	8·80	7·47	4·86	5·03	7·12
11·8	11·5	11·0	10·1	9·4	9·5	9·5	8·1	5·4	5·55	7·8
190	188	182	169	159	162	164	143	97	100	146
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
22·1	21·9	21·7	21·5	21·3	21·2	21·0	20·8	20·7	20·5	19·7
22·0	21·8	21·5	21·3	21·1	21·0	20·8	20·3	20·3	20·4	19·6
536	528	511	473	445	452	456	399	266	272	398
3030	3030	3063	3091	3119	3147	3176	3204	3232	3260	3402
0·177	0·174	0·167	0·153	0·143	0·143	0·144	0·125	0·082	0·083	0·116

[*Notes for Table XXVIII on following 4 pages*

NOTES FOR TABLE XXVIII

[a] 1913 from Gini, *Metron*, 1933. 1919–29, Professor Hijkata's results were published in the Mitsubishi Economic Research Bureau's *Monthly Circular* for March 1934. Shiomi (*Kyoto Economic Review*, 1934) makes an independent estimate for 1930 of 10,636 million yen, which is in close agreement. Mori (International Institute of Statistics, Tokyo Session, 1930) prepared an estimate of national income for 1925 of 13,382 million yen and gives a series of figures purporting to show national income since 1887. Certain data are also provided by Mr. Kaya, a former Finance Minister (*Japan's Finance and Industry*, Foreign Affairs Association of Japan).

Year	National Income at Factor Cost		
	Hijkata	Kaya	Mori
1919	10·66	..	5·91
1920	9·44	7·95	7·95
1921	9·98	..	10·69
1922	10·65	..	13·39
1923	10·63	..	13·26
1924	11·50	..	12·88
1925	12·35	..	13·38
1926	12·05	12·5	
1927	12·04	..	
1928	12·42	..	
1929	11·92	..	

1930–44 Report of Economic Stabilisation Board, 1950. From 1946, official National Income Division.

[b] Indirect taxes less subsidies in recent years, from *Oriental Economist*, 26.xi.39.

[c] A base is established in the year 1934. For food consumption constituting 34 per cent of the whole, as shown by family budget studies, Japanese quantities of consumption are directly revalued to I.U. retail values. For rice and wheat the

CONSUMPTION PER HEAD OF POPULATION, 1934

	Ounces	I.U.
Rice	129·0	·725
Wheat (as bread)	16·1	·086
Meat and poultry	1·7	·021
Fish	29·5	·220
Eggs (number)	1·0	·033
Milk (pint)	0·12	·009
Butter and cheese	0·2	·005
Sugar and honey	2·6	·010
Tea	0·3	·006
Fruit and vegetables (pence)	..	·500
	..	1·615

average consumption of 1933–35 is taken. The Japanese statistics of rice consumption are given in *koku*, equivalent to 4·96 English bushels, and appear to refer to the volume of polished rice. A deduction is made for the amount of rice (230 million lb.) estimated to be used in brewing *saké*, of which the output is 150 million gallons. In the case of fruit and vegetables, an estimate can only be based on the acreage grown, which is 2·3 million acres in Japan as against 1·3 million acres in England and Wales, or 7 per cent more per head. This is in accord with what is known of the Japanese dietary. In the case of fish, the coastal pelagic and trawling outputs are added together, together with the fish caught by Japanese fishermen on the coasts of the Japanese dependencies, the output of the floating canneries (other than exports) and half the weight of crustacea caught (shrimps, cuttlefish, etc.). Deduction is made for exports of fresh fish, and half the weight of fish-meal exports.

Direct comparison between factory prices in Japan and Britain can be made in respect of a number of products. The Japanese data are taken from *Kojo Tokeihyo*, or Factory Statistics (published in Japanese) for 1933, the British from Census of Production and Import Duties Act Inquiry. The Japanese prices are, in the first instance, reduced to British throughout on the basis of 1 yen = 1·87 shillings (average value 1924–30).

In general, certain Japanese prices, particularly silk and cotton prices, are below English, while others are higher. The geometric average for textile prices for 1933 shows English prices 25 per cent higher than Japanese at the rate of exchange quoted, i.e. the purchasing power of £1 in 1953 was equal to that of 8·6 yen. For hosiery, the purchasing power of £1 was equivalent to that of 5·5 yen only.

We have no information about retail prices in Japan, and must assume that these wholesale prices are indicative of the purchasing power of money. The difference between factory and retail prices largely consists of labour costs, and may be lower in Japan than elsewhere. It may be concluded, therefore, that the purchasing power of the yen, in comparison with English prices, may be even higher than is indicated by the above figures, and is unlikely to be lower.

	Japan, 1933	Britain, 1933
Textiles :		
Coarse cotton, pence per yd.	3·12	3·69
Velvet, pence per yd.	7·1	9·4
Crêpe silk, pence per yd.	13·8	53·5
Crêpe silk rayon, pence per yd.	9·0	13·8
Flannel, pence per yd.	22·3	17·6
Linen piece goods, pence per sq. yd.	19·9	9·5
Knit goods :		
Cotton stockings and socks, shillings per doz.	2·61	6·52
Silk stockings, shillings per doz.	15·9	23·5

A number of other direct price comparisons are possible from data given in *Japanese Trade and Industry*. Cement (export price) was 14·9 yen per ton in 1937, as against a British price of £1·27. Bicycles were produced at 20 yen each as against an average British price of £3·4 at works. Shipbuilding costs per ton for a 7000-ton steamer were 150 yen as against about £9 in England. For the nine principal chemical products we have the following comparison (for 1933) :

The purchasing power of the yen is not so high here. Taking a geometric mean from the above data, the yen's purchasing power averages 12·8 to the £1.

The yen has a very high purchasing power, however, in the case of fuel. To an industrial buyer, according to the Mitsubishi Bureau (*loc. cit.* p. 345), electricity only cost 2 sen per kilowatt-hour and gas 30 sen per 1000 cubic feet. The corresponding price of electricity in Britain (for industrial users) was 0·78d., and of gas 40d. for general consumers, or, say, 30d. for industrial consumers. It is possible that the Japanese gas is of lower calorific value, but on the basis of the electricity

	Japanese Price, yen per metric ton	British Price £ per British ton
Sulphuric acid	19·2	3·49
Hydrochloric acid	35·9	3·18
Nitric acid	127·6	16·3
Soda ash	98·8	5·57
Caustic soda	167·3	10·91
Bleaching powder	79·3	4·99
Acetic acid	444·0	35·4
Glycerine	690·0	34·8
Magnesium carbonate	234·0	15·0

figure we can say that the yen has a purchasing power of 39d., in the case of gas a good deal higher. Komo (*Weltwirtschaftliches Archiv*, September 1938) quotes a retail price of electricity as 5 sen per kwh. and of petrol at 13 sen (synthetic 18 sen) per litre, indicating a value of the yen of 52, 23 and 32 pence respectively.

Some data on rents in Japan were published in the 1940 Report of the Australian Trade Commissioner in Japan. In thirty-five cities with a population under 500,000 (it will be remembered that this was the criterion for the selection of cities for rent comparison in the other countries) the average rent [1] of a house was 14·2 yen: and the index figures show that Japanese rents in 1940 had not risen appreciably since 1934. It is understood that this represents a four-roomed house. The average rent of four-roomed houses without bathrooms in Bristol and Newcastle (cities under 500,000) in 1934 was 40s. 6d. per month (International Labour Office *Year Book*, 1934–35), giving the yen a purchasing power of 34 pence.

An unweighted average of all the above data is used in valuing the non-food purchasing power of the yen:

Purchasing Power of the Yen in Pence

Textiles	28·0
Hosiery	44·0
Chemicals	19·0
Bicycles	41·0
Cement	20·0
Ships	14·0
Industrial fuel	48·0
Retail fuel	38·0
Rents	34·0
General average	31·8

Urban consumption in 1934 appears to have included 2·6 billion yen of food consumption and 5·1 billion non-food. The latter is equated to £676 million or 3·9 billion I.U. and the former to 4·0 billion I.U. (assuming 70 per cent of the population urban), making the general level of purchasing power 1·025 per yen.

[1] The following were the figures for the larger cities (yen per month): Kobe, 25·1; Osaka, 24·0; Tokyo, 23·7; Yokohama, 18·9; Kyoto, 16·1; Nagoya, 14·6.

Between 1914 and 1930 wholesale prices are used for the price correction. The former seems more reliable than the retail price series, when a large part of the national income still consisted of agricultural produce consumed on the farms. Since 1930 a composite wholesale-retail index has been used.

Year	Prices, 1934 Base, Retail			
	Bank of Japan	Osaka, Asahi, Shimbun	Imperial Cabinet (linked 1937)	Wholesale
1930	1·05	..	..	1·02
1931	0·915	0·925	..	0·86
1932	0·915	0·945	..	0·91
1933	0·975	0·97	..	1·01
1934	1·0	1·0	..	1·0
1935	1·025	1·04	..	1·045
1936	1·07	1·07	..	1·11
1937	1·17	1·11	1·17	1·34
1938	1·34	1·19	1·29	1·415
1939	1·50	1·275	1·415	1·565
1940	1·74	..	1·68	1·75
1941	1·77	..	1·72	1·86
1942	1·81	..	..	2·00
1943	..	..	..	2·12
1944	..	..	..	..

[d] From 1946, deduced from real income on 1934–36 base by official index number of real income. This, however, is computed from income at factor cost, and has been raised by factor of 1·04, because since the war the ratio of income at market prices to income at factor cost has exceeded the pre-war ratio in this proportion.

[e] Interpolated from Census. Since 1948, direct estimates by Labour Force Survey of numbers in work, less 8·43 million females in agriculture.

[f] Current registrations of unemployment have to be multiplied by a factor of about 1·5 in post-war years to agree with Census results.

[g] The summary of results prepared by Professor Foxwell [1] in 1901 shows that the average number of hours then worked per year, taking holidays into account, was 3770, or 72·5 per week. The number of holidays was just over 50 per year.

Exact current records begin in 1926. The Imperial Cabinet Statistical Office now publishes a figure for the general average of hours per day.[2] Average number of hours per day and of days per month from 1929 to 1937 are given in the *International Labour Review*, April 1939. Average days per month in 1929 were 26·9, or 6·19 per week, and this figure is assumed to be applicable to the period 1926–29. It is assumed that the fall in hours from 1900 to 1926 was fairly regularly spaced. Post-war averages per week from I.L.O., multiplied by 50.

[1] *Economic Journal*, 1901.
[2] Quoted in International Labour Office *Year Book*.

TABLE XXIX

Netherlands (billion guilders)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Income at factor cost [a]	17·55	17·02	15·62	14·11	12·89	11·25	9·33	4·17	3·93	5·63	5·59	5·72	5·26
Income at market price	20·3	19·67	17·72	15·96	14·23	12·07	9·93	..	..	..	..	..	..
I.U. per unit national currency [c]	..	..	..	..	..	0·335 [b]	..	..	..	..	..	..	..
Real income, I.U. billion [d]	5·13	4·98	4·98	4·80	4·49	4·04	3·53	2·06	2·02	3·05	3·14	3·45	3·59
Real income, including imputation	5·26	5·11	5·11	4·93	4·62	4·17	3·66	2·19	2·15	3·18	3·27	3·58	3·72
Real income per head population	506	499	505	495	472	434	389	237	234	350	362	399	419
Export surplus	−0·46	−2·24	−2·47	−1·49	−2·25	−2·39	−1·55	..	..	..	..	..	..
Net external income	..	0·40	0·32	0·40	0·26	0·23	0·12	..	..	..	..	..	..
Sum of above in I.U. billion	−0·02	−0·46	−0·60	−0·33	−0·94	−0·72	−0·51	..	..	..	..	..	..
Exports, I.U. billion [e]	1·08	1·02	0·86	0·64	0·42	0·29	0·14	..	..	..	..	..	..
Imports, I.U. million [e]	1·12	1·28	1·25	0·94	0·85	0·78	0·50	..	..	..	..	..	..
Real product, I.U. million	5·24	5·31	5·32	4·96	5·13	4·40	3·81	2·18	2·15	3·18	3·27	3·58	3·52
Labour force, million	3·88	3·85	3·81	3·77	3·74	3·70	3·66	3·63	3·59	3·55	3·51	3·48	3·44
Numbers in work, million	3·74	3·75	3·73	3·71	3·70	3·64	3·57	3·61	3·57	3·53	3·44	3·36	3·24
Real product per man-year [f]	1400	1418	1426	1338	1384	1210	1067	604	602	902	952	1067	1085
Hours per year	2440	2440	2440	2445	2435	2440	2435	2330	2400	2485	2410	2260	2195
Real product per man-hour	0·574	0·581	0·585	0·547	0·569	0·495	0·437	0·258	0·250	0·363	0·395	0·472	0·494

TABLE XXIX (*contd.*)

NETHERLANDS

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
Income at factor cost [a]	5·21	4·90	4·80	4·36	4·25	4·34	4·39	4·56	5·13	5·86	6·11	5·98	5·60
Income at market price	5·74	5·40	5·31	4·81	4·68	4·75	4·78	4·93	5·49	6·29	6·50	6·36	5·96
I.U. per unit national currency [c]	..	0·722	0·714	0·728	0·695	0·664	0·656	0·639	0·582	0·537	0·501	0·497	0·502
Real income, I.U. billion [d]	4·08	3·90	3·80	3·50	3·25	3·15	3·14	3·15	3·20	3·35	3·26	3·17	3·00
Real income, including imputation	4·21	4·03	3·93	3·63	3·37	3·27	3·26	3·26	3·31	3·46	3·37	3·28	3·11
Real income per head population	480	464	457	426	400	392	396	400	414	439	434	428	410
Export surplus	..	−0·38	..	..	..	..	..	..	..	..	..	..	..
Net external income	..	0·40	0·37	0·29	0·22	0·18	0·23	0·27	0·37	0·56	0·57	0·67	0·61
Sum of above in I.U. billion	..	0·01	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. billion [e]	..	0·66	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million [e]	..	1·00	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	3·92	3·68	3·67	3·42	3·22	3·03	3·11	3·09	3·09	3·16	3·08	2·95	2·80
Labour force, million	3·40	3·37	3·33	3·29	3·25	3·22	3·18	3·14	3·11	3·07	3·03	2·99	2·95
Numbers in work, million	3·10	3·02	2·96	2·88	2·87	2·89	2·86	2·87	2·97	2·97	2·95	2·92	2·86
Real product per man-year [f]	1263	1220	1240	1189	1122	1048	1088	1077	1040	1063	1043	1010	979
Hours per year	2390	2400	2400	2400	2400	2400	2400	2450	2500	2550	2550	2550	2550
Real product per man-hour	0·528	0·508	0·516	0·494	0·467	0·436	0·453	0·439	0·416	0·416	0·408	0·395	0·384

[*contd. overleaf*

TABLE XXIX (*contd.*)

NETHERLANDS

	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914
Income at factor cost [a]	5·51	5·39	5·24	5·01	5·08	5·48	6·01	5·45	4·12	3·59	3·55	3·09	2·60
Income at market price	5·86	5·72	5·54	5·30	5·38	5·78	6·28	5·72	4·32	3·77	3·73	3·24	2·73
I.U. per unit national currency [c]	0·501	0·471	0·475	0·482	0·461	0·417	0·382	0·431	0·460	0·590	0·640	0·695	0·832
Real income, I.U. billion [d]	2·94	2·70	2·63	2·56	2·48	2·41	2·40	2·47	1·99	2·23	2·39	2·25	2·27
Real income, including imputation	3·05	2·80	2·73	2·66	2·58	2·51	2·50	2·57	2·09	2·33	2·49	2·35	2·37
Real income per head population	408	379	376	372	367	363	366	382	316	357	388	356	381
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	0·61	0·54	0·48	0·44	0·42	0·55	0·50	..	..	..	..	..	..
Sum of above in I.U. billion	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. billion [e]	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million [e]	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	2·74	2·54	2·50	2·45	2·39	2·28	2·31	2·37	1·89	2·13	2·29	2·15	2·16
Labour force, million	2·91	2·87	2·83	2·78	2·73	2·68	2·63	2·58	2·53	2·48	2·43	2·38	2·33
Numbers in work, million	2·82	2·78	2·73	2·66	2·62	2·58	2·57	2·53	2·48	2·44	2·39	2·34	2·29
Real product per man-year [f]	973	914	916	922	913	884	900	938	763	875	959	919	944
Hours per year	2550	2550	2550	2550	2550	2550	2550	2650	2750	2850	3000	3200	3300
Real product per man-hour	0·381	0·358	0·358	0·361	0·357	0·346	0·352	0·353	0·277	0·307	0·320	0·287	0·286

TABLE XXIX (*contd.*)

NETHERLANDS

	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900
Income at factor cost [a]	2·67	2·56	2·38	2·28	2·20	2·14	2·08	2·04	1·95	1·88	1·85	1·80	1·76	1·70
Income at market price	2·81	2·70	2·51	2·41	2·32	2·26	2·19	2·15	2·06	1·99	1·95	1·90	1·85	1·80
I.U. per unit national currency [c]	0·815	0·840	0·866	0·872	0·883	0·888	0·865	0·890	0·905	0·912	0·914	0·921	0·919	0·886
Real income, I.U. billion [d]	2·29	2·27	2·17	2·10	2·05	2·01	1·90	1·91	1·87	1·81	1·78	1·75	1·70	1·59
Real income, including imputation	2·39	2·37	2·27	2·20	2·15	2·11	2·00	2·00	1·97	1·90	1·87	1·84	1·79	1·68
Real income per head population	389	392	382	376	372	370	356	361	360	353	352	352	346	329
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	0·27	..	..	..	..	..	..	..	..	..	..	..	..	0·14
Sum of above in I.U. billion	..	..	..	.	..	..	..	..	..	..	..	..	..	..
Exports, I.U. billion [e]	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million [e]	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	2·17	2·16	2·17	2·01	1·97	1·93	1·83	1·84	1·82	1·75	1·73	1·71	1·67	1·56
Labour force, million	2·28	2·25	2·21	2·18	2·14	2·11	2·08	2·04	2·01	1·97	1·94	1·91	1·88	1·84
Numbers in work, million	2·24	2·21	2·17	2·14	2·10	2·07	2·04	2·00	1·97	1·94	1·91	1·88	1·85	1·81
Real product per man-year [f]	970	978	955	940	938	933	897	920	924	903	906	910	904	862
Hours per year	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300
Real product per man-hour	0·294	0·296	0·289	0·285	0·284	0·283	0·272	0·279	0·280	0·273	0·274	0·276	0·274	0·261

[*Notes overleaf*

NOTES FOR TABLE XXIX

[a] To 1920, *De Nederlandsche Conjunctuur*, Speciale Onderzoekingen No. 4.

[b] Deduced from price comparison for November 1946.

[c] Data to 1939 deduced from 1929. Trend of British prices used before 1913.

[d] Official index number of real income, on 1947 base, since 1938. This series indicates a purchasing power of the guilder in 1938 of 0·722 I.U., as against 0·606 deduced from 1929 base. This difference is distributed linearly over the period 1929–38.

[e] In default of any figures earlier than 1938, it is assumed that in 1950 the guilder had a purchasing power of 0·16 I.U. (i.e. purchasing power of $1÷3·805) over both imports and exports.

[f] Official figures from 1931 : for earlier years Trade Union percentage assumed applicable to ⅓ of labour force.

TABLE XXX

New Zealand (million £)

(Years ending 31st March)

	1952–53	1951–52	1950–51	1949–50	1948–49	1947–48	1946–47	1945–46	1944–45	1943–44	1942–43	1941–42	1940–41	1939–40
Income at factor cost [a]	..	609	594	474	412	406	360	344	324	320	279	255	250	238
Income at market price	..	663	639	508	446	445	391	375	353	349	304	276	271	258
I.U. per unit national currency [b]	..	2·53	2·80	2·94	3·00	3·23	3·23	3·23	3·28	3·31	3·51	3·62	3·87	4·23
Real income, I.U. million	..	1678	1791	1496	1338	1439	1264	1214	1158	1157	1069	1000	1048	1091
Real income, including imputation	..	1710	1823	1528	1370	1471	1296	1246	1190	1190	1102	1034	1082	1126
Real income per head population	..	879	958	817	747	815	737	739	720	729	673	635	660	692
Export surplus	..	39	25	27	19	1	22	32	−2	−20	15	19	23	14
Net external income	..	−6·0	−5·1	−6·7	−6·4	−4·0	−4·8	..	..	..	..	..	..	..
Sum of above in I.U. million	..	83	55	59	38	−10	55	87	−26	−86	32	47	66	29
Exports, I.U. million	..	339	341	356	341	327	307	261	271	264	312	266	298	269
Imports, I.U. million	..	403	365	304	300	284	186	156	259	317	184	174	196	230
Real product, I.U. million	..	1563	1744	1521	1373	1524	1362	1264	1228	1223	1198	1079	1114	1136
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work. '000 [c]	..	759	744	729	715	701	687	674	671	668	665	661	658	655
Real product per man-year	..	2062	2342	2084	1923	2176	1982	1879	1829	1833	1800	1631	1695	1733
Hours per year	..	1996	1996	1996	1999	2002	2021	2050	2050	2050	2050	2050	2050	2050
Real product per man-hour	..	1·034	1·173	1·044	0·962	1·087	0·981	0·915	0·891	0·894	0·878	0·795	0·827	0·845

[contd. overleaf

TABLE XXX (*contd.*)

NEW ZEALAND

	1938–39	1937–38	1936–37	1935–36	1934–35	1933–34	1932–33	1931–32	1930–31	1929–30	1928–29	1927–28	1926–27	1925–26	1901
Income at factor cost [a]	228	215	197·8	168·0	152·5	147·6	130·0	135·5	152·6	171·2	176·7	168·5	154·1	153·9	33·9
Income at market price	248	234	216	186·6	169·8	163·5	143·4	149·1	167·8	187·8	192·1	183·0	168·4	168·1	36·4
I.U. per unit national currency [b]	4·58	4·89	5·21	5·38	5·81	5·65	5·41	5·03	4·59	4·65	4·50	4·44	4·44	4·71	7·18
Real income, I.U. million	1137	1146	1127	1003	986	924	776	751	770	874	865	812	748	792	262
Real income, including imputation	1172	1191	1162	1038	1021	959	811	786	805	904	891	836	770	813	272
Real income per head population	731	750	745	665	657	622	531	520	540	613	612	580	546	590	334
Export surplus	3	11	12·5	10·2	16·0	15·4	11·0	8·5	0·6	6·2	10·7	3·7	−4·5	2·8	..
Net external income	−7·0	−7·0	−7·2	−7·7	−7·8	−8·2	−8·0	−8·8	−9·4	−9·3	−9·0	−8·5	−8·1	−7·8	−4·6
Sum of above in I.U. million	−18	20	28	13	47	41	16	−1	−40	−14	8	−21	−56	−24	..
Exports, I.U. million	266	278	281	265	270	278	236	215	212	206	201	193	179	221	..
Imports, I.U. million	259	261	220	180	153	123	123	123	190	215	190	180	197	180	..
Real product, I.U. million	1197	1188	1195	1110	1091	1073	908	879	867	909	894	870	808	878	305
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, '000 [c]	650	628	609	600	593	578	567	563	565	565	557	550	543	537	331
Real product per man-year	1841	1891	1963	1849	1842	1858	1600	1561	1535	1609	1603	1581	1490	1632	921
Hours per year	2053	2060	2230	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2500
Real product per man-hour	0·898	0·917	0·881	0·798	0·795	0·801	0·690	0·674	0·662	0·694	0·692	0·681	0·643	0·704	0·368

NOTES FOR TABLE XXX

[a] National income for 1901 from Coghlan, *The Seven Colonies of Australasia*: 1925–26 to 1938–39, from an unpublished memorandum by F. B. Stephens and the present writer. "Aggregate private income" officially estimated from tax returns is obviously too low for this period. Thus in 1934–35, when the value of primary and secondary production was £97·0 millions, and the wholesale value of goods available for consumption was £88·3 millions, the official estimate was only £106·4 millions (unofficial £152·5). Building and service industries occupy over half of New Zealand's working population and the former estimate is obviously untenable.

A new official series begins with a figure of £193·7 millions in 1938–39. The difference between this and the £235 millions obtained from the previous source is assumed to represent differences of definition and also tax evasion (for which no allowance was made). The difference was eliminated linearly over 5 years.

[b] Based on 1949–50. Separately revalued for (*a*) buildings and public works, (*b*) plant and machinery, (*c*) consumption, each revalued by its own index number. The 1901 figure is obtained from Australian data.

[c] Numbers in work (excluding unemployed) obtained from same memorandum by F. B. Stephens and present author, 1925–26 to 1937–38 (based on Census and recorded unemployment). From 1938–39 extrapolated from Census populations, less recorded unemployment. In 1945 the occupied population numbered 635,000 from which we must deduct 7000 unemployed, and to which we must add 45,000 in the Forces. Since 1947, official index of employment has shown a rate of increase of 2 per cent per year.

TABLE XXXI

NORWAY (billion krone)

	1952	1951	1950	1949	1948	1947	1946	1939	1938	1937	1936	1935	1934	1933
Income at factor cost [a]	16·60	15·70	13·18	12·03	11·30	10·28	8·65	5·03	4·68	4·50	3·92	3·50	3·25	3·08
Income at market price [a]	18·31	17·12	13·95	12·57	11·67	10·96	9·29	5·35	4·99	4·80	4·19	3·74	3·47	3·29
I.U. per unit national currency [b]	0·0844	0·0920	0·104	0·108	0·111	0·115	0·125	0·211	0·217	0·223	0·241	0·252	0·255	0·258
Real income, I.U. million	1547	1574	1451	1358	1292	1260	1161	1128	1085	1073	1012	943	885	850
Real income, including imputation	1609	1635	1511	1417	1350	1317	1217	1179	1135	1122	1060	990	931	895
Real income per head population	483	496	463	439	423	416	389	399	387	385	365	343	324	313
Export surplus,[d] million kroner	(–1000)	481	–592	–1005	–604	–1140	–469	–44	42	26	68	28	67	101
Net external income, million kroner	–60	–80	–67	–60	–63	–47	–34	–57	–60	–65	–73	–70	–71	–83
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million [d]	..	..	..	..	..	..	..	384	340	361	292	254	240	216
Imports, I.U. million	..	..	..	..	..	..	..	375	338	368	300	275	245	220
Real product, I.U. million [c]	(1595)	1712	1685	1613	1477	1431	1260	1210	1151	1124	1078	1000	949	911
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work. '000 [e]	1440	1429	1419	1408	1389	1364	1313	1278	1250	1229	1196	1160	1133	1112
Real product per man-year	1108	1199	1187	1147	1062	1048	960	948	921	915	903	862	837	819
Hours per year	..	..	2230	2200	2210	2190	2155	2260	2205	2245	2275	2250	2200	2200
Real product per man-hour	0·496	0·538	0·532	0·521	0·481	0·478	0·445	0·419	0·418	0·408	0·397	0·383	0·381	0·373

[a] From 1930, Aukrust, *Nasjonalregnskap* and subsequent official figures. Earlier years estimated from taxable incomes. 1891 and 1913, Kiaer, *Staatsoekonomisk Tidskrift*, 1892 and 1913.

[b] Based on 1929. From 1930, Aukrust's *Domestic Use of Goods and Services.* 1952 provisional.

[c] From 1930, Aukrust's real net product (pp. 246-7) slightly adjusted for more recent revisions of national income figures.

[*Notes contd. below*

TABLE XXXI (*contd.*)

NORWAY

	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1913	1891
Income at factor cost [a]	3·09	3·07	3·57	3·57	3·49	3·65	4·00	4·49	4·46	4·54	4·61	5·35	6·31	1·15	0·49
Income at market price [a]	3·29	3·26	3·77	3·83	3·73	3·86	4·21	4·70	4·66	4·73	4·79	5·49	6·46	1·24	0·53
I.U. per unit national currency [b]	0·252	0·249	0·233	0·230	0·221	0·212	0·191	0·163	0·165	0·181	0·173	0·164	0·148	0·426	0·510
Real income, I.U. million	830	812	879	919	825	817	804	766	768	857	828	900	957	529	270
Real income, including imputation	874	855	921	962	868	861	848	811	813	903	874	947	1004	560	290
Real income per head population	308	303	327	344	311	310	307	295	298	333	324	355	380	229	145
Export surplus,[d] million kroner	101	−181	−131	−91	−146	−81	−56	−106	−283	−332	−348	−610	−1167	−64	..
Net external income, million kroner	−86	−70	−72	−69	−70	−60	−51	−62	−70	−60	..	..	..	..	..
Sum of above in I.U. million	..	..	−47	−37	−48	−30	−20	−27	−58	−71	−70	−110	−180	−40	..
Exports, I.U million [d]	233	191	233	234	201	195	186	176	157	147	142	106	172	147	..
Imports, I.U. million	216	254	276	256	235	220	199	201	199	205	193	165	264	188	..
Real product, I.U. million [c]	889	839	925	977	882	866	855	813	829	916	893	998	1092	559	290
Labour force	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work, '000 [e]	1098	1073	1107	1103	1081	1049	1044	1078	1087	1069	1035	1024	1072	943	700
Real product per man-year	810	780	837	885	817	827	818	755	763	856	863	974	1020	592	415
Hours per year	2200	2300	2400	2400	2400	2300	2300	2300	2300	2400	2400	2600	2800	3000	3000
Real product per man-hour	0·368	0·339	0·349	0·369	0·341	0·359	0·355	0·328	0·331	0·357	0·359	0·374	0·364	0·197	0·138

[d] Exports defined to include shipping income.

[e] From 1930, Aukrust's figures (pp. 322-3) less 80,000 throughout to allow for some difference of definition. The 1930 figure now corresponds to the Census, less 40,000 women employed in agriculture, and 20,000 unemployed. For earlier years interpolated from Census, with Trade Union percentage of unemployment assumed to have applied to ⅓ of the labour force.

TABLE XXXII

PERU (billion soles)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942
Income at factor cost	14·51	11·98	9·39	7·12	5·45	4·27	3·67	3·13	2·61	2·51
Income at market price	15·16	12·64	9·87	7·38	5·68	4·47	3·86	3·31	2·78	2·66
I.U. per unit national currency	0·0721	0·0793	0·0890	0·102	0·134	0·173	0·190	0·213	0·244	0·262
Real income, I.U. million	1092	1003	877	755	761	774	734	706	679	697
Real income, including imputation	1240	1140	995	856	864	878	833	801	770	792
Real income per head population	145	136	121	107	109	113	109	106	104	109
Export surplus	..	..	..	..	..	..	..	..	..	..
Net external income ($ million)	−21·6	−9·6	−11·3	−13·5	−11·2	−18·5	..	..	..	..
Sum of above in I.U. million	−13	−6	−7	−8	−7	−14	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	1253	1146	1002	864	871	892	849	819	790	814
Labour force	..	..	..	..	..	..	..	..	..	..
Numbers in work, million	2·58	2·52	2·47	2·42	2·38	2·33	2·30	2·26	2·22	2·18
Real product per man-year	485	455	405	357	367	383	369	362	356	392
Hours per year	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..

TABLE XXXIII

Poland (billion zloty)

	1948	1947	1946	1938	1929	1928	1926	1924	1913
Income at factor cost	..	..	..	17·7 [f]	..	20 [c]	19·8 [d]	..	..
Income at market price	..	..	..	20	28·5 [a]	23·5	22·3	..	..
I.U. per unit national currency	..	..	..	0·266	0·162	0·164	0·165	..	..
Real income. I.U. million	..	..	2650 [g]	5320	..	3850	3675	..	..
Real income, including imputation	..	..	3050	5850	4620 [b]	4365	4190	..	..
Real income per head population	..	..	128	167	148	142	139	129 [e]	199 [e]
Export surplus	..	..	..	..	..	..	..	..	..
Net external income	..	..	..	−0·1	−0·4	−0·3	−0·2	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..
Real product, I.U. million	6860 [h]	5620 [h]	..	5877	4685	4415	4233	..	..
Labour force	..	..	..	..	..	..	..	..	..
Numbers in work	..	..	..	..	..	..	..	..	..
Real product per man-year	..	..	..	..	..	..	..	..	..
Hours per year	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..

[a] Estimate prepared by Birmingham University Bureau of Slavonic Studies, with an addition of 2·5 billion zloty for Governmental services not covered.

[b] In this study consumption by farm families was included at imputed retail value so no further imputation is necessary.

[c] Fisk, *American Economic Review*. 1930.

[d] Dresdner Bank, *Wirtschaftliche Kräfte der Welt.*

[e] Computed from 1926 by Dresdner Bank figures.

[f] As shown in *Polish National Economic Plan*. A later official publication (*National Income of Poland 1947*) suggests that 0·8 billion should be deducted for depreciation.

[g] Trend of real income estimated in *Polish National Economic Plan* on 1938 base.

[h] Real product on 1938 base officially computed.

TABLE XXXIV

PORTUGAL (billion escudos)

	1951	1950	1949	1948	1947	1938	1914
Income at factor cost	43·5	40·6 [b]	35·9 [b]	34·5 [b]	33·3 [b]	13·2 [b]	0·435 [a]
Income at market price	45·4	42·8	38·0	36·4	35·2	14·1	0·48
I.U. per unit national currency	0·0280	0·0275	0·0272	0·0281	0·0275	0·061	1·20
Real income, I.U. million	1270	1177	1034	1022	969	860	576
Real income, including imputation	1348	1256	1114	1103	1051	952	655
Real income per head population	157	148	133	133	128	127	109
Export surplus	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	..	..
Sum of above in I.U. million	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..	..
Labour force	..	..	..	..	..	..	..
Numbers in work	..	..	..	..	..	..	..
Real product per man-year	..	..	..	..	..	..	..
Hours per year	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..

[a] Estimate by Vandellos, *Metron*, 1925, of 2·44 billion francs.
[b] Gross product at factor cost less 5 per cent.

TABLE XXXV

PUERTO RICO (million dollars)

(Years beginning 1st June)

	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939
Income at factor cost [a]	747	654	645	617	612	565	554	477	435	359	278	228
Income at market price	(800)	(690)	..	..	..	623	612	569	..	..	..	..
I.U. per unit national currency [b]	0·650	0·694	..	..	..	..	..	..	..	..	..	..
Real income, I.U. million [c]	520	479	465	446	..	..	..	325	303	289	268	242
Real income, including imputation	560	516	501	481	..	..	..	350	327	312	289	261
Real income per head population	252	235	231	224	..	..	..	173	164	160	151	139
Export surplus	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	..	..	..	..	..	−7	−11	−10	−7	−7	−4	−4
Sum of above in I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Exports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Labour force	..	..	..	..	..	..	..	..	..	..	..	..
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	..	..	..	..	..	..	..	..	..	..	..	..
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..
	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929		
Income at factor cost [a]	207	217	210	199	177	179	140	156	169	189		

[a] Up to 1938 from Creamer. The Net Income of the Puerto Rican Economy.
[b] Based on 1950–51.
[c] Prior to 1949, from Creamer's and official estimates of trend of real income.

TABLE XXXVI

Spain (billion pesetas)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1935
Income at factor cost	233·9	151·8	119·0	114·0	107·5	93·9	65·5	65·1	57·2	51·3	44·2	36·5	27·1	24·8
Income at market price	..	..	..	..	..	..	..	..	..	..	..	..	..	..
I.U. per unit national currency [a]	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real income, I.U. billion	12·1 [b]	10·12	8·88	8·91	8·94	9·18	8·37	8·92	8·29	7·28	6·77	7·30	6·22	8·00
Real income, including imputation	12·7	10·76	9·54	9·59	9·64	9·90	9·11	9·68	9·07	8·08	7·59	8·14	7·10	8·67
Real income per head population	452	386	345	349	353	366	340	363	344	309	292	316	278	353

	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921
Income at factor cost	25·5	22·0	25·6	24·2	24·0	25·2	21·9	23·8	23·1	25·0	23·0	21·9	21·0	23·0
Income at market price	..	25·8	29·4	27·4	27·2	28·4	25·1	26·6	25·8	27·5	26·0	24·8	23·9	25·7
I.U. per unit national currency [a]	..	0·285	0·276	0·266	0·276	0·285	0·293	0·273	0·276	0·273	0·280	0·291	0·285	0·273
Real income, I.U. billion	8·28	7·35	8·11	7·29	7·51	8·10	7·36	7·26	7·13	7·50	7·28	7·22	6·82	7·02
Real income, including imputation	8·97	8·06	8·84	8·04	8·28	8·91	8·21	8·15	8·05	8·46	8·27	8·25	7·88	8·12
Real income per head population	369	334	370	3240	3257	3492	3465	366	365	387	381	383	368	385

	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906
Income at factor cost	29·0	24·8	23·3	19·4	15·8	12·2	10·8	10·6	10·2	10·5	9·9	9·8	9·8	9·7	9·2
Income at market price	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..
I.U. per unit national currency [a]	0·272	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Real income, I.U. billion	8·70	8·13	7·62	7·82	7·50	6·85	7·34	7·10	6·85	7·41	6·78	6·75	6·70	6·38	6·30
Real income, including imputation	9·83	9·25	8·74	8·93	8·61	7·95	8·43	8·18	7·92	8·46	7·92	7·80	7·75	7·44	7·36
Real income per head population	473	446	421	436	422	390	421	409	400	435	401	404	403	390	389

[a] Based on 1929.

[b] Wholesale price index used.

TABLE XXXVII

SWEDEN (billion kronor)

	1952	1951	1950	1949	1948	1947	1946	1945	1944
Income at factor cost	..	..	23·99	22·25	21·44	..	..	..	..
Income at market price	33·88 [a]	32·18 [a]	25·94 [a]	24·30	23·41	20·80 [d]	19·39 [d]	17·53 [e]	16·72 [e]
I.U. per unit national currency [f]	0·130	0·139	0·161	0·163	0·166	0·174	0·179	0·180	0·180
Real income, I.U. million	4405	4736 [g]	4522 [g]	4348 [g]	3885	3620	3470	3156	3012
Real income, including imputation	4528	4613	4399	4225	4008	3743	3593	3279	3135
Real income per head population	635	652	626	607	582	551	534	495	477
Export surplus, million kronor	−866	34	−409	−91	−972	−1985	−851	672	−828
Net external income, million kronor	..	52	14	16	19	22	30	..	..
Sum of above in I.U. million	−106	12	−63	−12	−158	−342	−147	123	−144
Exports, I.U. million [h]	(645)	591	567	453	394	358	290	219	112
Imports, I.U. million [h]	(715)	692	584	470	540	599	487	154	220
Real product, I.U. million	4564	4500 [i]	4445 [i]	4220 [i]	4020	3844	3543	3221	3171
Labour force, million [j]	2·96	2·96	2·97	2·98	2·97	2·96	2·95	2·94	2·94
Numbers in work, million [k]	2·93	2·94	2·94	2·95	2·94	2·93	2·91	2·89	2·88
Real product per man-year	1560	1531	1512	1430	1369	1313	1219	1114	1100
Hours per year [o]	2400	2400	2400	2400	2400	2400	2400	2400	2400
Real product per man-hour	0·650	0·638	0·630	0·595	0·570	0·547	0·508	0·464	0·458

[*contd. overleaf*]

TABLE XXXVII (*contd.*)

SWEDEN

	1943	1938–39[b]	1938	1937	1936	1935	1934	1933	1932	1931	1930
Income at factor cost	..	9·98	..	..	..	..	..	..	..	..	..
Income at market price	16·10 [e]	10·74	10·81 [c]	10·38 [c]	9·19 [c]	8·38 [c]	7·85 [c]	6·92 [c]	6·97 [c]	7·38 [c]	8·16 [c]
I.U. per unit national currency [f]	0·179	0·251	0·255	0·260	0·268	0·276	0·276	0·276	0·269	0·265	0·256
Real income, I.U. million	2882	2696	2756	2698	2462	2315	2167	1911	1877	1958	2088
Real income, including imputation	3005	2820	2879	2820	2583	2435	2285	2027	1991	2070	2198
Real income per head population	463	446	457	449	413	390	367	327	322	336	358
Export surplus, million kronor	−648	..	−243	−126	−121	−182	−4	−19	−209	−305	−112
Net external income, million kronor	..	..	104	101	79	87	67	78	128	−6	20
Sum of above in I.U. million	−112	..	−35	−6	−11	−26	17	16	−22	−82	−24
Exports, I.U. million [h]	168	..	437	508	452	406	401	343	285	321	390
Imports, I.U. million [h]	226	..	508	512	451	415	393	331	331	434	430
Real product, I.U. million	3059	..	2843	2822	2595	2452	2276	2023	1967	2039	2182
Labour force, million [j]	2·94	..	2·89	2·86	2·83	2·80	2·77	2·74	2·71	2·68	2·65
Numbers in work, million [k]	2·87	..	2·76	2·74	2·69	2·63	2·57	2·48	2·47	2·50	2·53
Real product per man-year	1067	..	1030	1030	965	932	886	816	797	816	862
Hours per year [o]	2400	..	2310	2441	2466	2446	2436	2356	2356	2415	2494
Real product per man-hour	0·444	..	0·427	0·422	0·391	0·381	0·364	0·346	0·338	0·337	0·346

TABLE XXXVII (*contd.*)

SWEDEN

	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1913
Income at factor cost	..	..	..	..	..	..	..	..	..	..	..
Income at market price	8·25 [c]	7·86 [e]	7·65	7·49	7·29	7·17	6·93	6·73	7·66	10·26	2·93
I.U. per unit national currency [f]	0·248	0·245	0·247	0·244	0·235	0·239	0·239	0·223	0·180	0·154	0·415
Real income, I.U. million	2045	1926	1888	1829	1714	1715	1660	1501	1382	1578	1219
Real income, including imputation	2154	2034	1995	1935	1819	1819	1763	1603	1483	1678	1320
Real income per head population	353	333	328	319	301	302	294	268	250	285	234
Export surplus, million kronor	30	−133	32	−70	−87	−163	−152	40	−161	−1036	−29
Net external income, million kronor	30	25	19	7	3	6	3	−12	−26	−31	−46
Sum of above in I.U. million	15	−26	13	−15	−20	−37	−36	−6	−34	−164	−31
Exports, I.U. million [h]	424	360	365	313	295	273	238	242	156	227	294
Imports, I.U. million [h]	419	399	368	336	306	319	285	222	189	300	243
Real product, I.U. million	2144	2027	1979	1927	1828	1810	1752	1617	1484	1769	1300
Labour force, million [j]	2·62	2·59	2·56	2·53	2·50	2·47	2·44	2·41	2·38	2·35	2·06
Numbers in work, million [k]	2·50	2·48	2·44	2·41	2·39	2·37	2·32	2·19	2·13	2·30	2·02
Real product per man-year	858	817	812	800	766	765	756	739	698	769	644
Hours per year [o]	2546	2472	2560	2546	2518	2535	2474	2426	2286	2445	2994
Real product per man-hour	0·337	0·331	0·317	0·314	0·300	0·302	0·306	0·304	0·305	0·315	0·215

[*contd. overleaf*

TABLE XXXVII (*contd.*)

SWEDEN (million kronor)

	1919	1918	1917	1916	1915	1914	1912	1911	1910	1909	1908	1907	1906	1905
Income at market price	9539	8276	6389	5175	4135	3556	3175	2961	2935	2673	2727	2717	2462	2186
I.U. per krona	0·155	0·180	0·250	0·316	0·357	0·410	0·416	0·444	0·438	0·438	0·434	0·440	0·464	0·473
Real income, I.U. million	1479	1492	1597	1637	1476	1461	1322	1317	1286	1171	1185	1197	1143	1035
Real income, including imputation	1579	1592	1697	1738	1572	1562	1424	1419	1388	1270	1282	1292	1236	1125
Real income per head population	271	274	293	303	277	276	255	256	252	233	237	241	232	213
Real product, I.U. million	1584	1598	1706	1751	1593	1581	1442	1438	1406	1287	1299	1307	1250	1137
Labour force, '000	2310	2269	2228	2187	2146	2105	2023	1982	1941	1920[m]	1903	1885	1870	1855
Numbers in work [n]	2255	2251	2212	2178	2122	2036	1958	1925	1853	1784	1766	1819	1805	1767
Real product per man-year	703	711	772	804	753	777	737	747	758	721	735	719	693	644
Hours per year	2770	2874	3022	3110	3035	2916	3003	3003	3005	2662	3007	3082	3082	2978
Real product per man-hour	0·254	0·247	0·239	0·258	0·248	0·267	0·245	0·249	0·252	0·271	0·244	0·233	0·223	0·216

	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891
Income at market price	2193	2112	1928	1874	1982	1855	1787	1618	1527	1360	1262	1271	1285	1317
I.U. per krona	0·483	0·477	0·485	0·489	0·477	0·483	0·505	0·527	0·545	0·541	0·551	0·521	0·501	0·492
Real income, I.U. million	1012	1008	937	917	945	897	903	853	833	737	697	662	643	648
Real income, including imputation	1100	1094	1021	998	1024	975	981	930	910	813	723	737	718	722
Real income per head population	210	210	197	193	200	192	195	187	184	166	149	153	150	151
Real product, I.U. million	1117	1106	1033	1010	1033	984	991	940	920	824	785	748	729	732
Labour force, '000	1838	1825	1817	1802	1789	1773	1753	1738	1719	1703	1687	1673	1670	1668
Numbers in work [n]	1733	1743	1748	1744	1744	1730	1706	1685	1664	1618	1586	1576	1578	1616
Real product per man-year	642	635	592	578	591	568	580	558	552	509	495	475	461	482
Hours per year	3078	3086	3060	3066	3118	3150	3146	3150	3208	3218	3205	3180	3218	3280
Real product per man-hour	0·209	0·206	0·194	0·188	0·190	0·180	0·184	0·177	0·172	0·158	0·155	0·149	0·143	0·138

TABLE XXXVII (*contd.*)

SWEDEN

	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876
Income at market price	1228	1156	1102	990	1049	1075	1121	1132	1123	1072	1122	1000	1029	1121	1137
I.U. per krona	0·507	0·518	0·541	0·562	0·542	0·515	0·491	0·473	0·470	0·458	0·469	0·493	0·463	0·432	0·430
Real income, I.U. million	623	598	596	557	569	554	551	535	527	491	526	493	478	484	488
Real income, including imputation	697	672	671	632	644	630	627	611	604	568	603	569	551	557	560
Real income per head population	146	141	142	134	137	135	136	133	132	124	132	125	122	125	127
Real product, I.U. million	710	685	685	646	658	642	639	622	615	579	611	578	559	565	568
Labour force, '000	1671	1671	1672	1678	1678	1670	1660	1658	1658	1658	1660	1653	1631	1610	1589
Numbers in work [n]	1638	1639	1619	1586	1551	1563	1575	1617	1618	1600	1585	1514	1551	1554	1549
Real product per man-year	433	419	423	406	425	410	406	384	380	362	385	382	361	364	367
Hours per year	3307	3307	3300	3307	3296	3260	3275	3230	3236	3262	3267	3200	3200	3285	3345
Real product per man-hour	0·131	0·127	0·128	0·123	0·129	0·126	0·124	0·119	0·118	0·111	0·118	0·119	0·113	0·111	0·110

	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861
Income at market price	1118	1096	1093	930	845	788	720	679	708	699	665	666	666	682	641
I.U. per krona	0·431	0·429	0·444	0·480	0·449	0·511	0·490	0·462	0·478	0·507	0·524	0·522	0·501	0·476	0·489
Real income, I.U. million	482	469	484	446	379	403	353	314	338	355	348	348	331	325	314
Real income, including imputation	553	539	553	514	446	470	419	379	402	418	410	409	391	384	372
Real income per head population	126	125	129	122	107	113	101	90	97	101	100	101	98	97	96
Real product, I.U. million	559	545	559	520	452	476	425	385	408	424	414	413	395	387	375
Labour force, '000	1568	1543	1526	1507	1493	1492	1494	1492	1488	1477	1461	1443	1428	1415	1402
Numbers in work [n]	1543	1524	1511	1492	1467	1441	1427	1416	1415	1447	1439	1423	1375	1350	1363
Real product per man-year	362	357	370	348	308	331	298	272	289	293	288	290	287	286	276
Hours per year	3285	3230	3306	3225	3305	3345	3120	3218	3330	3430	3320	3427	3258	3226	3358
Real product per man-hour	0·110	0·111	0·112	0·108	0·093	0·099	0·096	0·084	0·087	0·085	0·087	0·085	0·088	0·089	0·082

[*Notes overleaf*

NOTES FOR TABLE XXXVII

[a] Gross national expenditure is widely defined to include all repair work. Under these circumstances depreciation (not recorded for these last three years) is taken at 18·2 per cent of gross product (as in 1939).

[b] July-June.

[c] From *Översikt av inkomst ock konsumtionsläget*, Konjunkturinstitutet, 1945, with foreign investment income added back.

[d] Depreciation assumed same proportion of gross product at market prices as in 1948.

[e] Depreciation less indirect taxation plus subsidies assumed to be same proportion of product as in 1946.

[f] From 1943, based on purchasing power of 0·1777 I.U. in November 1946. Earlier years based on 1929.

[g] Deduced from trend of real product below.

[h] In 1929 the exchange value of the krona was $0·268 and its purchasing power 0·23 I.U. over imports and 0·234 I.U. over exports.

[i] Deduced from trend of real product shown in *Konjunkturläget Våren*, 1952, p. 38.

[j] Interpolated from Census figures. Between 1940 and 1945 there was a strong downward trend in the ratio of labour force to population. Extrapolation of this trend for later years indicates an almost constant labour force, which is in agreement with the evidence published annually in *Översikt over det Ekonomiska Läget.*

[k] Trade Union unemployment percentages assumed applicable to 40 per cent of labour force.

[l] For this and all previous years, figures given in *National Income of Sweden* (Professor Lindahl and others), vol. i, p. 237, subject to the following amendments : (i) omission of "services of durable consumers' goods other than housing" (pp. 224-225) ; (ii) of the "joint debits" deductions, restoring the amounts deducted for public and administration (pp. 228-9) but not the amounts deducted for banking, etc. (pp. 210-11) ; (iii) deducing net income payable abroad (vol. ii, p. 598). Prior to 1896 "Alternative I" has to be used which gives a less precise treatment for building.

[m] For this and earlier years extrapolated back from 1910 in proportion to the members aged 15–65.

[n] For 1919 and previous years, British unemployment percentages used (adjusted so as to reduce weight of the engineering and metal group of industries to ¼).

[o] From *Wages in Sweden*, p. 48 and I.L.O. *Year Book*.

TABLE XXXVIII

SWITZERLAND (billion francs)

	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941
Income at factor cost [a]	19·50	18·09	17·36	17·65	16·84	15·03	13·47	12·52	12·05	11·25	10·44
Income at market price [a]	20·55	19·19	18·25	18·42	17·61	15·66	13·82	12·82	12·38	11·52	10·63
I.U. per unit national currency [b]	0·146	0·152	0·150	0·149	0·154	0·160	0·160	0·133	0·135	0·143	0·159
Real income, I.U. million	2998	2914	2737	2748	2716	2500	2210	1708	1670	1650	1690
Real income, including imputation	3079	2994	2816	2826	2793	1576	2285	1782	1743	1722	1761
Real income per head population	649	638	606	617	616	575	517	408	403	403	414
Export surplus, million francs	−1225	−625	−324	−1564	−1552	−747	249	−54	−90	−456	−551
Net external income, million francs	300	200	100	70	70	50	50	50	50	50	50
Sum of above in I.U. million	−135	−64	−34	−221	−229	−111	48	−1	−5	−58	−80
Exports, I.U. million	470	390	345	345	316	278	157	110	173	204	234
Imports, I.U. million	752	637	511	632	633	451	134	138	202	255	301
Real product, I.U. million	2932	2811	2684	2760	2705	2414	2260	1755	1714	1729	1774
Labour force, '000	2026	2019	2013	2007	2000	1993	1987	1981	1974	1968	1962
Numbers in work, '000 [d]	2010	1983	1981	1995	1984	1973	1955	1949	1946	1931	1923
Real product per man-year	1457	1417	1357	1383	1362	1222	1155	901	882	896	925
Hours per year	2390	2375	2370	2385	2395	2390	2380	2365	2355	2340	2350
Real product per man-hour	0·609	0·597	0·573	0·580	0·569	0·512	0·485	0·382	0·375	0·383	0·393

[contd. overleaf

TABLE XXXVIII (*contd.*)

SWITZERLAND

	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930
Income at factor cost [a]	9·36	8·83	8·70	8·16	7·46	7·43	7·60	7·70	7·68	8·61	9·34
Income at market price [a]	9·68	9·23	9·05	8·53	7·83	7·81	7·96	8·04	8·03	8·95	9·67
I.U. per unit national currency [b]	0·183	0·200	0·202	0·202	0·213	0·215	0·213	0·210	0·200	0·183	0·174
Real income, I.U. million	1771	1846	1827	1720	1670	1680	1695	1690	1606	1639	1682
Real income, including imputation	1841	1915	1895	1787	1736	1745	1759	1753	1668	1700	1742
Real income per head population	436	455	453	427	416	420	425	425	406	417	431
Export surplus, million francs	−532	−583	−279	−521	−384	−464	−590	−736	−944	−882	−782
Net external income, million francs	100	130	130	130	130	150	150	150	150	200	250
Sum of above in I.U. million	−79	−91	−30	−79	−54	−68	−94	−123	−159	−125	−93
Exports, I.U. million	240	267	275	268	223	209	205	196	192	293	343
Imports, I.U. million	374	508	430	430	388	401	430	447	471	516	506
Real product, I.U. million	1786	1767	1770	1704	1627	1621	1628	1625	1548	1602	1672
Labour force, '000	1995	1948	1941	1935	1929	1922	1916	1910	1903	1897	1891
Numbers in work, '000 [d]	1922	1868	1809	1793	1743	1756	1785	1774	1794	1849	1863
Real product per man-year	930	947	980	950	933	926	914	916	862	869	897
Hours per year	2365	2363	2315	2335	2325	2315	2315	2265	2325	2350	2400
Real product per man-hour	0·393	0·401	0·423	0·406	0·401	0·400	0·394	0·404	0·370	0·370	0·374

TABLE XXXVIII (*contd.*) SWITZERLAND

	1929	1928	1927	1926	1925	1924	1913	1899	1895	1890
Income at factor cost [a]	9·47	9·16	8·53	8·35	8·19	7·74	3·87	2·33	2·17	1·93
Income at market price [a]	9·77	9·44	8·79	8·60	8·43	7·96	3·96	2·38	2·22	1·98
I.U. per unit national currency [b]	0·171	0·171	0·172	0·170	0·164	0·163	0·275	0·321 [c]	0·351 [c]	0·317 [c]
Real income, I.U. million	1671	1615	1511	1461	1381	1299	1089	764	779	628
Real income, including imputation	1730	1672	1567	1515	1435	1350	1136	805	827	669
Real income per head population	430	419	396	385	367	346	293	246	265	230
Export surplus, million francs	−599	−543	−504	−537	−463	−490	−488	..	..	..
Net external income, million francs	300	330	320	310	300	290	200	150	150	120
Sum of above in I.U. million	−51	−36	−32	−39	−27	−33	−79	..	..	..
Exports, I.U. million	384	389	379	333	348	334	336	..	..	..
Imports, I.U. million	483	471	438	426	418	420	462	..	..	..
Real product, I.U. million	1682	1626	1540	1461	1392	1297	1089	757	775	631
Labour force, '000	1879	1867	1856	1844	1832	1821	1732	1475	1377	1252
Numbers in work, '000 [d]	1863	1851	1832	1816	1810	1791	1715	1461	1357	1240
Real product per man-year	904	878	840	805	770	723	635	519	571	510
Hours per year	2400	2400	2400	2400	2400	2400	2700	2900	3000	3160
Real product per man-hour	0·376	0·365	0·350	0·335	0·321	0·301	0·235	0·179	0·190	0·161

[a] National income 1890–99, Geering and Hotz, *Wirtschaftskunde der Schweiz*, 1902 (with addition for personal services): for 1913, Dresdner Bank, *Wirtschaftliche Kräfte der Welt*, average of the three data given: Shirras (*Journal of the Royal Statistical Society*, 1925, p. 543) gives 4000 million francs for 1913: 1924 and 1929–1942, *Statistisches Jahrbuch der Schweiz*: 1943, Bank of International Settlements, Fourteenth Report: interpolation 1924–29 from estimates by Marschak and Lederer in *Kapitalbildung*.

[b] Since 1944, on 1948 base: earlier years on 1929.

[c] Estimated from British price trend.

[d] Official unemployment percentages since 1940. For earlier years, twice unemployment registrations.

TABLE XXXIX

UNION OF SOUTH AFRICA (£ million)

(Years ended 30th June for 1946–47 and subsequently, earlier years ending 31st March)

	1951–52	1950–51	1949–50	1948–49	1947–48	1946–47	1945–46	1944–45	1943–44	1942–43	1941–42	1940–41
Income at factor cost [a]	1123	1125	939	829	771	690	651	608	572	531	492	440
Income at market price [a]	1158	1159	970	870	813	732	674	635	596	552	515	456
I.U. per unit national currency [b]	2·69	2·91	3·08	3·15	3·33	3·50	3·53	3·62	3·71	3·89	4·20	4·46
Real income, I.U. million	3114	3375	2990	2740	2705	2565	2378	2298	2214	2150	2162	2040
Real income, including imputation	3281	3539	3151	2898	2860	2717	2526	2442	2355	2288	2297	2177
Real income per head population	256	284	258	241	243	245	224	220	216	213	217	209
Export surplus [c]	..	..	..	..	..	..	..	..	..	..	..	..
Net external income	–122	–102	–87	–66	–59	–22	–22	–21	–21	–22	–25	–27
Sum of above in I.U. million	–328	–297	–268	–207	–196	–77	–78	–76	–78	–86	–105	–120
Exports, I.U. million [c]	..	..	..	..	..	..	..	..	..	..	..	..
Imports, I.U. million	..	..	..	..	..	..	..	..	..	..	..	..
Real product, I.U. million	3609	3836	3419	3105	3056	2794	2604	2578	2433	2374	2405	2292
Labour force, million	4·91	4·84	4·77	4·70	4·63	4·56	4·49	4·42	4·35	4·28	4·21	4·14
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	735	793	717	661	659	611	581	569	559	555	571	553
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..

TABLE XXXIX (*contd.*) UNION OF SOUTH AFRICA

	1939–40	1938–39	1937–38	1936–37	1935–36	1934–35	1933–34	1932–33	1931–32	1930–31	1929–30	1928–29
Income at factor cost [a]	400	364	375	369	329	299	278	235	217	236	257	271
Income at market price [a]	414	378	389	383	343	313	292	249	230	248	271	285
I.U. per unit national currency [b]	4·65	4·71	4·87	5·02	5·05	4·98	25·10	4·94	4·72	4·54	4·42	4·42
Real income, I.U. million	1925	1783	1896	1923	1732	1561	1489	1180	1086	1080	1200	1262
Real income, including imputation	2054	1909	2019	2043	1849	1675	1600	1288	1191	1182	1299	1358
Real income per head population	201	191	205	212	195	180	176	144	136	138	155	165
Export surplus [c]	..	33	23	21	15	28	42	35	15	14	8	14
Net external income	–28	–25	–22	..	..	..	..	..	–13	–14	–15	–16
Sum of above in I.U. million	–130	38	5	5	–20	50	133	99	9	0	–31	–9
Exports, I.U. million [c]	..	507	540	419	423	364	394	424	393	416	411	412
Imports, I.U. million	..	500	539	480	428	385	289	225	279	298	358	326
Real product, I.U. million	2184	1868	2015	1977	1864	1604	1572	1388	1306	1300	1383	1453
Labour force, million	4·06	3·99	3·92	3·85	3·77	3·70	3·62	3·56	3·49	3·42	3·35	3·28
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	539	468	514	515	494	434	435	390	373	380	412	443
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..

[*contd. overleaf*

TABLE XXXIX (contd.) UNION OF SOUTH AFRICA

	1927–28	1926–27	1925–26	1924–25	1923–24	1922–23	1921–22	1920–21	1919–20	1918–19	1917–18	1911–12
Income at factor cost [a]	270	250	237	230	222	208	177	207	248	193	171	131
Income at market price [a]	284	263	250	241	232	218	186	216	255	200	177	136
I.U. per unit national currency [b]	4·40	4·46	4·40	4·54	4·53	4·50	3·98	3·48	4·30	4·59	4·75	5·61
Real income, I.U. million	1248	1176	1100	1094	1051	981	741	752	1098	918	841	762
Real income, including imputation	1341	1266	1187	1178	1134	1059	816	824	1167	984	904	807
Real income per head population	167	161	154	157	154	147	116	119	172	147	137	135
Export surplus [c]	18	9	18	19	23	10	9	−11	39	26	30	17
Net external income	−16	−17	−16	−16	−18	..	..	..	..	..	..	..
Sum of above in I.U. million	−9	−36	9	14	23	−36	−36	−101	90	36	57	−6
Exports, I.U. million [c]	405	369	378	336	338	278	295	279	329	292	308	311
Imports, I.U. million	297	283	252	237	194	162	141	204	130	157	151	235
Real product, I.U. million	1440	1388	1304	1263	1155	1211	1006	1000	1276	1083	1004	889
Labour force. million	3·21	3·14	3·07	3·00	2·93	2·86	2·78	2·73	2·69	2·71	2·67	2·40
Numbers in work	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-year	449	442	425	421	394	423	361	367	474	400	377	370
Hours per year	..	..	..	..	..	..	..	..	..	..	..	..
Real product per man-hour	..	..	..	..	..	..	..	..	..	..	..	..

[a] Official since 1938–39 — previously *South African Journal of Economics*, June 1944.

[b] Since 1946–47 based on September 1946 — previously on 1929.

[c] Gold output included with exports.

TABLE XL

UNITED STATES (billion $)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941
Income at factor cost [a]	290·4	277·6	239·2	216·3	223·5	198·7	180·3	182·7	183·8	169·7	137·1	103·8
Income at market price [a]	317·5	302·4	262·6	237·9	243·9	217·4	196·7	197·4	197·2	182·3	148·7	115·0
I.U. per unit national currency [b]	0·554	0·570	0·606	0·620	0·606	0·658	0·730	0·813	0·833	0·831	0·899	1·029
Real income, I.U. million [c]	175·9	172·2	159·2	147·7	147·9	143·1	143·5	160·4	164·2	151·4	133·7	118·2
Real income, including imputation	177·0	173·4	160·5	149·1	149·3	144·6	145·0	162·0	165·9	153·2	135·6	120·1
Real income per head population	1128	1122	1064	1000	1021	1003	1025	1159	1198	1121	1006	900
Export surplus, $ million	4384	3970	1319	5378	5471	9547	4778	5711	10434	9587	5284	1761
Net external income	1490	1594	1600	1404	1515	1191	860	356	412	352	352	356
Sum of above in I.U. million	3254	3171	1769	4205	4234	7066	4116	4932	9035	8259	5067	2178
Exports, I.U. million [d]	8710	8620	6710	7620	7450	9570	7160	6850	10100	10740	7160	5450
Imports, I.U. million [d]	5007	4820	4880	4015	4120	3620	3780	3580	3510	3250	2910	3920
Real product, I.U. billion	172·4 [g]	170·7 [g]	158·8 [g]	146·8 [g]	147·0 [g]	141·9 [g]	140·4 [g]	147·6 [g]	150·8 [g]	142·2 [g]	130·3 [g]	117·7 [g]
Labour force, million [eg]	63·0	62·8	63·0	62·1	61·4	60·2	57·5	53·9	54·6	55·6	56·4	55·9
Numbers in work, million [fg]	61·3	60·9	59·9	58·7	59·3	58·1	55·2	52·9	53·9	54·5	53·7	50·3
Real product per man-year	2812	2803	2651	2501	2479	2442	2544	2790	2798	2572	2426	2340
Hours per year [h]	2110	2110	2085	2105	2140	2175	2215	2305	2330	2425	2200	2130
Real product per man-hour	1·333	1·328	1·271	1·188	1·158	1·123	1·149	1·210	1·201	1·061	1·103	1·099

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TABLE XL (*contd.*)

UNITED STATES

	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Income at factor cost [a]	81·35	72·53	67·38	73·63	64·72	56·79	48·61	39·58	41·69	58·87	75·00	87·35
Income at market price [a]	90·95	81·41	76·36	82·73	73·32	64·58	56·14	46·62	48·50	75·78	82·29	94·50
I.U. per unit national currency [b]	1·121	1·117	1·111	1·079	1·160	1·145	1·195	1·290	1·243	0·946	0·948	0·924
Real income, I.U. million [c]	102·2	91·3	84·6	89·2	84·9	73·9	67·2	60·1	60·3	71·6	77·9	86·6
Real income, including imputation	104·2	93·3	86·6	91·2	86·9	75·9	69·2	62·1	62·2	73·5	79·8	88·4
Real income per head population	789	712	666	707	679	596	547	495	499	591	648	725
Export surplus, $ million	1342	789	911	185	−137	−100	389	184	283	334	782	842
Net external income	352	312	431	280	296	364	302	322	392	546	745	809
Sum of above in I.U. million	1899	1230	1491	503	185	303	825	652	839	832	1448	1520
Exports, I.U. million [d]	4600	3930	3760	3760	2920	2780	2640	2460	2460	3175	3890	4705
Imports, I.U. million [d]	3310	3140	2740	3820	3410	3080	2500	2500	2300	2850	3220	3800
Real product, I.U. billion	103·0 [g]	92·9	86·1	90·7	86·2	75·3	68·5	61·4	61·5	73·0	79·0	87·8
Labour force, million [eg]	55·7	55·6	55·0	54·3	53·7	53·1	52·5	51·8	51·2	50·7	50·1	49·4
Numbers in work, million [fg]	47·6	46·1	44·6	46·6	44·7	42·5	41·2	39·0	39·2	42·7	45·8	47·8
Real product per man-year	2164	2015	1930	1946	1928	1772	1662	1574	1569	1710	1725	1836
Hours per year [h]	2050	2020	1900	2100	2155	2080	2000	2085	2040	2180	2240	2340
Real product per man-hour	1·056	0·998	1·016	0·927	0·895	0·852	0·831	0·755	0·769	0·784	0·770	0·785

TABLE XL (*contd.*)

UNITED STATES

	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917
Income at factor cost [a]	..	..	..	..	..	..	..	..	..	..	..	..
Income at market price [a]	88·3	86·3	87·7	81·8	77·5	76·6	65·7	64·6	79·0	68·8	63·2	56·5
I.U. per unit national currency [b]	0·915	0·921	0·894	0·899	0·919	0·906	0·922	0·877	0·743	0·845	0·820	0·974
Real income, I.U. million [c]	80·8	79·5	78·4	73·5	71·2	69·4	60·6	56·7	58·7	58·1	51·8	55·0
Real income, including imputation	82·8	81·3	80·2	75·2	72·9	71·1	62·0	58·3	60·3	59·7	53·3	56·5
Real income per head population	686	683	682	650	639	635	563	537	565	567	510	545
Export surplus, $ million	1037	681	378	683	981	375	719	1976	2950	4016	3118	3281
Net external income	805	741	753	742	622	710	565	340	476	509	(400)	(70)
Sum of above in I.U. million	1682	1310	1012	1283	1473	975	1184	2012	2550	3890	2880	3260
Exports, I.U. million [d]	4560	4430	4100	3820	3640	3245	3175	3420	4140	4285	3920	4750
Imports, I.U. million [d]	3340	3285	3260	3020	2820	2880	2785	2150	2560	2355	2190	2955
Real product, I.U. billion	82·3	81·1	80·0	74·7	72·2	70·5	61·2	57·6	59·3	57·7	52·2	55·0
Labour force, million [eg]	48·7	47·9	47·2	46·4	45·7	44·7	43·8	43·2	42·3	41·3	41·8	41·3
Numbers in work, million [fg]	45·8	45·0	44·5	42·6	41·6	41·5	38·3	36·5	40·2	39·8	40·6	40·0
Real product per man-year	1797	1802	1797	1753	1735	1699	1598	1580	1473	1450	1284	1375
Hours per year [h]	2325	2320	2335	2345	2300	2385	2390	2260	2360	2330	2470	2505
Real product per man-hour	0·772	0·777	0·769	0·748	0·754	0·712	0·669	0·699	0·624	0·597	0·520	0·548

[*contd. overleaf*

TABLE XL (*contd.*)

UNITED STATES

	1916	1915	1914	1904–13	1898–1903	1894–1903	1889–98	1884–93	1879–88	1874–83	1869–78	1860	1850
Income at factor cost [a]	..	..	..	..	..	..	..	..	..	..	..	3·96	2·38
Income at market price [a]	45·0	39·2	35·5	28·03	21·10	15·34	12·46	11·64	10·54	8·81	7·00	4·02	2·42
I.U. per unit national currency [b]	1·180	1·289	1·318	1·583	1·748	1·916	1·911	1·780	1·659	1·516	1·329	2·55	3·14
Real income, I.U. million [c]	53·1	50·5	46·8	44·4	36·9	29·4	23·8	20·7	17·48	13·36	9·30	10·23	7·60
Real income, including imputation	54·6	51·9	48·2	45·7	38·1	30·6	24·9	21·7	18·43	14·23	10·10	11·25	8·43
Real income per head population	535	516	487	508	467	411	368	355	337	292	232	357	362
Export surplus, $ million	3091	1094	471	476	511	393	160	57	109	130	−8	−20	−29
Net external income	0	−60	−110	−120	−115	−110	−100	−97	−87	−72	−82	−24	−12
Sum of above in I.U. million	3650	1332	476	563	693	561	115	−71	37	88	−120	−112	−128
Exports, I.U. million [d]	5610	3700	3550	3020	2713	2232	1710	1353	1202	993	656	444	238
Imports, I.U. million [d]	2975	2640	3260	2575	2035	1724	1712	1613	1379	1057	822	649	344
Real product, I.U. billion	53·6	51·6	48·0	45·6	38·1	30·5	24·8	21·4	18·22	14·08	10·06	11·16	8·45
Labour force, million [eg]	40·6	40·2	39·8	36·0	31·8	28·3	25·6	22·7	19·53	16·74	14·44	10·25	7·47
Numbers in work, million [fg]	39·3	37·5	37·0	33·6	29·7	25·8	23·6	21·1	18·2	15·40	13·60	9·74	7·10
Real product per man-year	1366	1379	1297	1358	1282	1183	1051	1014	1001	914	739	1146	1190
Hours per year [h]	2525	2540	2545	2695	2865	2940	2965	3005	3055	3125	3200	3430	3485
Real product per man-hour	0·541	0·543	0·510	0·504	0·447	0·402	0·354	0·337	0·328	0·292	0·231	0·334	0·341

[*Notes on pages* 197-200

NOTES FOR TABLE XL

[a] 1850 and 1860, Dr. King's estimates; 1900–13, Kuznets, *National Product Since 1869*, pp. 119 and 55 (using "wartime concept" since 1919); for years 1914–18, *National Product in Wartime*, pp. 128-9. Since 1929, Department of Commerce. Prof. Kuznets's figure includes certain indirect taxation and should therefore be comparable with national income at market prices. However, he excludes certain Government services from output, and his 1929 figure has to be raised by a factor 1·084 to equate it to Commerce Dept. result. For earlier years, where we do not have precise measurement of Government purchases of goods and services, we can obtain a comparable series from Federal Treasury statistics of "general expenditure" excluding Post Office and Veterans' Bureau, plus State and Local tax collections (from Senate Document 69, Federal State and Local Taxation, p. 352: years before 1915 from Census Reports). The figures are raised on this account by 7·8 per cent for the decade 1869–78 and by 6 to 7 per cent for other years before 1913; by a little over 5 per cent for the 1917–19 period (i.e. allowance for non-war public expenditure); and by a proportion rising during the following decade to 8·4 per cent in 1929. After making these adjustments, the results are shown as national income at market price.

[b] Prof. Kuznets's implicit price indexes on a 1929 base divided by 0·924 (in 1929 consumption prices exceeded the 1925–34 level by 7·9 per cent, construction costs by 8·4 per cent, prices of metals and metal goods by 9·3 per cent). For 1914–18 implicit prices from the estimation of real income given below. For 1850 and 1860, index of the Federal Reserve Bank of New York (data from Historical Statistics of the United States) linked to the Department of Labour index in 1913. From 1929, implicit from estimate of real income.

[c] From 1929 onwards, gross product at 1939 prices (*Survey of Current Business*, January 1951, and subsequent revisions) less depreciation, multiplied by 1·117. (The 1929 $ had a purchasing power of 0·924 I.U., and a gross national product of $103·8 billions in 1929 was revalued to $85·96 billions at 1939 prices.) For depreciation Kuznets's figures at 1929 prices are used for 1929–38. Since 1939 the allowances have been inadequate owing to rising prices and a special calculation is made.

The Department of Commerce has revalued gross product only. Money figures for depreciation are available, but in many cases these represent standard rates of depreciation allowance applied to assets purchased in the past at a much lower price than their present-day replacement cost. Over any period of rising prices, therefore, money allowances for depreciation, divided by the current price index for capital goods (or any other current price index), will seriously understate the real burden of depreciation.

There might be a way out of this difficulty if we could divide the money value of depreciation, not by the current price index, but by some skilfully weighted composite, in which we take some account of the lower book price, established in past years, on which many capital goods are still being depreciated. To obtain weights for such an index we have to make assumptions about the relative importance of such long-lived capital goods, and their rate of disappearance. The principal difficulty is that some of these long-lived capital goods will in course of time change hands by purchase; a gradually increasing proportion of them will be so affected as time goes on, although the majority will probably remain in the hands of their original owners until they wear out. When such purchases take place (through amalgamation of businesses and in other ways), the capital goods will be priced at somewhere nearer their present-day replacement cost. But all these are matters on which it is very difficult to obtain information, and for the present, therefore, at any rate we must defer the attempt to construct a

composite index which gives some weight to the lower capital goods prices of the past.

Quite a different alternative, therefore, has to be adopted, namely, to attempt to estimate depreciation directly in *real* terms, over the last ten years during which there has been a substantial price increase. In *National Product Since 1869* Prof. Kuznets estimates the stock of fixed capital, distinguishing construction and producers' durable equipment, in existence at the beginning of 1939, valued at 1929 prices. We first convert these figures to 1939 prices, for ease of comparison with Commerce Department data of real product. If we make the defensible assumptions that the average rate of depreciation for construction is $2\frac{1}{2}$ per cent, and for producers' durable equipment 10 per cent, we obtain a combined total which agrees closely with the depreciation actually charged in the year 1939, We carry this calculation forward year by year to 1949 by adding each year gross investment at 1939 prices, as shown by the Commerce Department, and deducting our assumed depreciation.

Year	Billions of $ at 1939 Prices					
	Construction			Producers' Durable Equipment		
	Stock at Beginning of Year	Gross Additions, including Public Construction	Depreciation at $2\frac{1}{2}$ per cent of Opening Stock	Stock at Beginning of Year	Gross Additions	Depreciation at 10 per cent of Opening Stock
1939	171·0	6·3	4·3	52·6	4·6	5·3
1940	173·0	6·9	4·3	51·9	6·0	5·2
1941	175·6	9·3	4·4	52·7	7·2	5·3
1942	180·5	10·4	4·5	54·6	4·4	5·5
1943	186·4	5·7	4·7	53·5	3·6	5·4
1944	187·4	3·1	4·7	51·7	5·1	5·2
1945	185·8	3·5	4·6	51·6	6·7	5·2
1946	184·7	6·6	4·6	53·1	9·9	5·3
1947	186·7	7·5	4·7	57·7	11·8	5·8
1948	189·5	9·0	4·7	63·7	12·6	6·4
1949	193·8	(9·0)	4·8	69·9	11·4	7·0
1950	198·0	(11·0)	4·9	74·3	13·1	7·4
1951	204·1	(10·0)	5·1	80·0	13·6	8·0
1952	209·0	(10·0)	5·2	85·6	13·6	8·6

After 1939, therefore, we use these figures, in place of those officially recorded, as a deduction for depreciation. By 1952, however, the ratio of depreciation to gross product, expressed in current money, had again risen to the same level as the real ratio, so this correction will not be necessary in future.

A similar problem arises for 1914–18. We have estimates of gross national product in Prof. Kuznets's *National Product in Wartime*. For depreciation here we have to work with much less precise data. The device adopted is to use the estimate made by Mr. Fabricant (in *Capital Consumption and Adjustment*) of depreciation in 1919, reduce it to 1914 prices by means of his index, and assume

a linear upward trend in the real burden of depreciation between the years 1914 and 1919.

DATA FROM *National Product in Wartime*

Year	Gross National Product, $ billion	Gross National Product at 1914 Prices, $ billion	Depreciation and Depletion at 1914 Prices, $ billion *	Net Produc 1914 Pric	Net Produc 1914 Pric I.U.†
1914	36·3	36·3	3·0	33·3	43·9
1915	39·8	39·2	3·3	35·9	47·3
1916	45·6	41·4	3·6	37·8	49·8
1917	57·5	43·6	3·9	39·7	52·3
1918	64·3	41·6	4·2	37·4	49·2

* Fabricant's figure for 1919, reduced to 1914 prices, would be 4·5 approximately, and a linear upward trend from 1914 is assumed.
† Linked on 1914, for which year the National Industrial Conference Board series indicates real income 3 per cent below 1913.

[d] Official figures of quantity of exports and imports available since 1919. For earlier years, U.S. exports valued on basis of British imports, and vice versa.

[e] 1869–1913, *National Product Since 1869*, p. 120. 1914–18, Mr. Long's estimate published in National Bureau of Economic Research, *Occasional Paper No. 14*, excluding " summer additions ". 1919–28, *National Income and Its Composition*, vol. i, p. 151. From 1929 onwards, *Annual Report on the Labour Force*.

[f] Figures of unemployment were arbitrarily assumed prior to 1879. An estimate for 1878, made by Blair, an ex-member of the Cabinet, showed 1,250,000 " artisans and labourers " unemployed in that year (Mundella, *Journal of the Royal Statistical Society*, 1878).[1]

It is known that 1878 was about the worst year of that period. Arbitrary estimates have to be made for other years in the 'seventies and 'eighties.

From 1897–1913 Prof. Douglas's unemployment percentages are used (*Real Wages in the U.S.* p. 460). Figures for manufacture and transport going back to 1889–96 are given by Prof. Douglas, p. 445, and including also building and mining from 1897 (p. 460). These percentages are deemed applicable to three-quarters of the labour force (i.e. excluding farmers, etc.).

1914–19, direct estimate of the numbers in work is made in *National Product in Wartime*, p. 145. It is not clear whether these include peace-time Forces. If they do not, they should be raised by about 200,000.

1919–28, *National Income and Its Composition*, vol. i, p. 151. Numbers for 1922 raised in the proportion 1·008, thence increasing linearly to 1928 to fit the post-1929 data given below.

From 1929, *Annual Report on Labour Force*. Unemployment does not cover those absent through holidays, sickness or temporary lay-off. Includes those on public-relief works.

[g] Since 1940 there have been great variations in the numbers of men in the Forces, and for recent years the precise numbers are not given. From this date onwards, therefore, their numbers are excluded from the labour force and their

[1] Fels (*Review of Economics and Statistics*, February 1949), judging by Carroll Wright's review of Massachusetts unemployed in 1878, concludes " that the estimate of 3,000,000 for the whole country was perhaps as much as five times too high ".

product is also excluded. This product is estimated at 1117 I.U. per man-year throughout (based on pre-war pay).

	1940	1941	1942	1943	1944	1945	1946
Forces in millions .	0·5	1·6	4·0	9·0	11·4	11·4	3·5

	1947	1948	1949	1950	1951	1952
Forces in millions .	1·4	1·3	1·5	1·5	(3·0)	(4·5)

[h] Department of Labour's combined figure for hours in manufacture, mining and railways interpolated and extrapolated by hours in manufacture from National Industrial Conference Board and National Association of Manufacturers (*The American Individual Enterprise System*). Prof. Douglas's *Real Wages in the U.S.* (p. 208) series also used for interpolation. Weighted composite prepared including rural hours. Average hours shown in Barger and Landsberg's *American Agriculture*, weighted according to the relative importance of the different regions, 2800 for 1909–13, and 2675 for 1932–36. Assumed to have fallen steadily from 70 per week in 1860.

The U.S. Department of Agriculture in *The Agricultural Situation*, April 1944, estimated that men living and working on farms (78 per cent of the farm-working personnel) did 60 hours per week in 1943 and 54 hours in 1939. Men working but not living on farms worked 50 hours in both years.

Farm Economics, February 1944, estimates that farmers and farm workers in New York State at that time were working an average of 3000 hours per year.

From 1942, combined figure given in *Monthly Report on Labour Force.*

contd. from p. 87]

It is of great interest to distil all the above experience, where we can, into simple figures of the long-period rate of growth or real product per man-hour. (Clearly we do more good by measuring this than by measuring real income per head, a figure which is subjected to the additional chance factors of changes in the terms of trade, of working hours and of the ratio of dependants to producers.) The table which follows was published (except for Norway and Canada) in the *Bulletin of the National Bank of Belgium*, July 1953.

Clearly it is not worthwhile to try to record every chance annual fluctuation, and to record rates of growth by decades is a somewhat arbitrary division. The most valuable procedure is to plot the results on logarithmic paper and to examine the trend line. For some countries, e.g. United States, a particularly uniform trend is found to prevail over the whole period for which reliable data are available. Where this is not so, we endeavour to establish

TABLE XLI

Countries for which Changes in Productivity can be Measured

	Rate of Change of Real Product per Man-hour, per cent per year	
Argentine . . .	1916–51	1·1
Australia . . .	1891–1913	0·0
	1913–29	2·1
	1929–39	1·0
	1939–52	1·6
Belgium . . .	1895–1913	2·6
	1913–38	1·3
	1938–51	2·1
Brazil * . . .	1929–49	1·0
Canada . . .	1870–1952	1·9
Chile . . .	1929–38	3·3
	1938–50	−0·5
Colombia * . .	1939–50	2·0
Cuba * . . .	1939–51	1·4
Denmark . .	1913–51	1·2
Finland . . .	1913–39	1·1
	1939–51	2·9
France . . .	1870–1951	2·3
Germany . .	1860–91	2·1
	1891–1913	0·6
	1913–38	1·6
	1938–53	0·0
Greece . . .	1891–1952	0·0
Ireland . . .	1926–45	1·4
Italy . . .	1901–25	3·5
	1925–39	0·7
	1939–53	3·8
Japan . . .	1914–29	3·2
	1929–40	1·4
	1940–52	2·4
Netherlands . .	1900–13	0·7
	1913–38	2·3
	1938–52	0·9
New Zealand . .	1901–52	2·2
Norway . . .	1891–1913	1·6
	1913–52	2·6
Peru * . . .	1942–51	2·4
Puerto Rico . .	1939–50	5·5
Portugal * . .	1914–51	0·8
Spain * . . .	1906–20	1·0
	1920–51	0·0
Sweden . . .	1861–90	1·5
	1890–1909	3·5
	1909–30	1·4
	1930–52	3·0
Switzerland . .	1890–1951	2·1
Union of South Africa * . .	1911–28	1·2
	1928–52	2·3
United Kingdom .	1870–95	1·6
	1895–1913	0·0
	1913–29	1·6
	1929–39	0·8
	1939–53	0·0
United States . .	1890–1952	2·3
U.S.S.R.† . .	1913–28	0·7
	1928–38	1·6
	1933–53	2·0

* Trend of real product per man-year — no information about hours.
† See Chapter IV.

the point or points at which there is a definite change in the trend line, and to record them, and the average rates of growth between these points. No such points are recorded in the table above as single years. In fact, an average of three years about the supposed turning-point is taken wherever possible.

Productivity in almost every country is interrupted by war. Naturally, this is not regarded as a change of trend, so long as productivity " gets back on to the line " within a reasonable number of years after the end of the war.

The Great Depression of the 1930s also had a marked effect on productivity in many countries. This was, however, by no means always the case ; in some countries real product per man-hour rose. The effects of the Great Depression on productivity seemed to have been most serious in Canada, which remained below normal until 1939, and then rose with extraordinary rapidity. We should regard this as a long-deferred but still temporary deviation ; if we do so, we then find a uniform long-period rate of growth ever since 1870.

DATA FOR PAST YEARS NOT SHOWN IN TABLES ABOVE

India

Taking our 1948–49 figures as a base, we can make an extrapolation for recent years, using the official index number of industrial production, and the *Eastern Economist* index for agricultural production.

For the period 1939–40 to 1947–48 the *Eastern Economist* also made its own calculations of real national income, which can be linked to Mr. Desai's series (see Table XLIII) on the year 1939–40.

Mr. Desai's work, published in the *Journal of the Royal Statistical Society*, 1948, covers the period 1931–32 to 1940–1941. He gives a series of money value of consumption and real value of consumption. He does not take into account Government provision of goods and services (except such as education) or net investments. Relatively, however,

these are comparatively small in India, and such evidence as we have shows that their ratio to consumption expenditure did not change greatly during the period under review.

TABLE XLII

INDIAN REAL INCOME IN BILLIONS OF O.U. (EXCLUDING SERVICES) EXTRAPOLATED FROM 1948–49

	Agriculture,* Fishing and Forestry	Industrial Products and their Distribution †	Distribution of Imports ‡	Total	Population, millions §	O.U. per Head
1952–53	43·7	22·8	1·6	68·1	362·3	188
1951–52	40·3	20·8	2·1	63·2	358·7	176
1950–51	40·3	18·6	1·7	60·6	355·1	170
1949–50	42·9	18·7	1·9	63·5	351·6	180
1948–49	40·8	19·2	1·8	61·8	348·1	177
1947–48	42·9	17·2	(1·8)	61·9	344·6	179

* *Eastern Economist* index for agriculture (fishing and forestry assumed to move in same proportion).
† Official index of industrial production for calendar years 1947–52.
‡ Index of volume of imports.
§ Assuming 1 per cent per annum trend from the 1951 Census figures: excluding Kashmir and tribal areas of Assam.

The trend of real consumption expenditure may therefore be taken to indicate the trend of real national income as a whole. To make Mr. Desai's figures comparable with other O.U. measurements we omit his entries for housing,

TABLE XLIII

BASED ON *Eastern Economist*, 31ST DECEMBER 1949. REAL INCOME PER HEAD AT 1939–40 PRICES, LINKED TO MR. DESAI'S SERIES ON 1939–40

1939–40	200	1944–45	191
1940–41	200	1945–46	188
1941–42	197	1946–47	176
1942–43	209	1947–48	185
1943–44	191		

amusement, passenger transport by public service vehicles, postal communications and services (these entries in any case included a number of rather arbitrary estimates).

The quanitites of agricultural products retained for consumption in the villages, without having been the subject of a cash transaction, are given an imputed value based on supplies actually sold, *net* of selling costs.

TABLE XLIV

	Billion O.U.	O.U. per Head
1931–32	74·2	218
1932–33	74·0	214
1933–34	74·2	212
1934–35	75·0	211
1935–36	75·6	210
1936–37	78·5	215
1937–38	78·5	212
1938–39	77·9	208
1939–40	76·3	200
1940–41	76·8	203

The base of Table XLIV, of 74·2 billion O.U. in the year 1931–32, is obtained in Table XLV.

The source was Professor V. K. R. V. Rao's *The National Income of British India, 1931–32.* ("British India" excludes what were then the "Native States" with some 23 per cent of the population of India as a whole, and Professor Rao's figures have to be adjusted accordingly.) The figures for 1925–29 are from an earlier work by Professor Rao entitled *An Essay on India's National Income, 1925–29.* In this book he also discusses critically what he regards as valuable in the work of earlier statisticians — Messrs. Shah and Khambata for 1921–22, F. J. Atkinson for 1895 and 1875, and Dr. Dadabhai Naoroji [1] for 1868.

It appears that, from a very low level in the nineteenth century, real income per head rose rapidly up to 1931, but has subsequently not even quite succeeded in maintaining

[1] It is not generally known that, at this early date, Dr. Naoroji came to England, successfully contested an election and sat in the British Parliament as a Radical member; as indeed an Indian, being a citizen of a Commonwealth country, could do now if he wished.

this level. Was this very low nineteenth-century level that which had always prevailed ? There is a good deal of evidence that it was not, but that at an earlier date real

TABLE XLV

Income in Billions of O.U.

	Agriculture, Fishing and Forestry *†	Industry, Mining, Handicraft and Building Products and their Distribution ‡	Distribution of Imports	Total	Per Head
1931–32	60·4‖	12·9	0·9	74·2	218
1925–29	46·3	8·2	1·3	55·8	165
1921–22	46·5	8·6§	0·8	55·9	174¶
1895	17·1	5·6	0·6	23·3	105
1875	..	5·0	0·4	..	..
1868	12·4	..	..	(17·5)	103

* The livestock products included herein are 15·1 billions in 1931–32, 6·0 in 1921–22 (7·0 if we use Professor Shirras's estimates) and only 0·7 in 1868. These results, however, are not discordant with the numbers of cattle, which were 170 millions in 1935, 90 millions in 1905 and only 27 millions in 1875.

† The rupee of 1925–29 is equated to 2·40 O.U., of 1921–22 to 2 14, of 1895 to 4·20 and of 1868 to 4·51, on the basis of wholesale price trends (two latter years calculated by Professor Rao).

‡ On the basis of the British export price trend, and the sterling-rupee exchange rate, the O.U. value of the rupee in this field is put at 2·64 in 1931–32, 2·01 in 1925–29, 1·17 in 1921–22, 3·44 in 1895 and 3 75 in 1875.

§ Calculated from 1931–32 by an index given by Dr. Anstey (*Economica*, 1936). Shah and Khambata's figure gives only 5·1, which is obviously too low.

‖ Based on Professor Rao's work.

		M. Rs.
Gross production of agriculture (*National Income of British India*, p. 71)		6,089
Minor crops (*ibid* p. 72)		1,747
Milk and meat (*ibid.* p. 114)		2,575
Fishing and hunting (*ibid.* p. 120)		120
Forestry (*ibid.* p. 119)		92
		10,623
Deductions :		
Industrial crops	609	
Seed	470	
Fodder	600	
Wastage	235	
		1,914
Net value		8,709
Subsequent revision (Sankhya, vol. 4, Part II)		600
		9,309
Including native states (Rs. billion)		12·08
O.U. value (billions)		60·4

It will be remembered that Professor Rao's prices of 1931–32, multiplied by 5, were arbitrarily taken as the basis for O.U. calculations of the value of farm products (because the quantities of farm products of 1948–49, multiplied by these prices, came to 1/5 of the ascertained 1948–49 value of all farm products). In fact the price ratio between 1931–32 and 1948–49 was about 3·56. Mr. Desai's food consumption of 18·8 billion rupees should by this reckoning therefore be valued at 65·8 billion O.U., or 72·1 billions including industrial crops and net food exports. The lower figure, however, is retained as a base for the subsequent series.

¶ Professor Shri Gopal Tiwari, in his study on the real income of United Provinces of Agra and Oudh, as they were then called — a large state in Central India — estimated that real income per head declined by 11 per cent between 1921–22 and 1931–32, but rose again to slightly above the 1921–22 level by 1938–39.

income had been a great deal higher. This is not surprising. From the death of Aurangzeb in 1707 to the final establishment of order under British rule in the mid-nineteenth century, India passed through a shocking period of war, anarchy and bloodshed, and a great decline in the level of economic productivity is all too appropriate. Professor Radhakamal Mukerjee, in his *Economic History of India*, boldly asserts that real wages are now less than half what they were at the beginning of the seventeenth century.

Relevant evidence on which to form a judgment of this period was assembled by Brij Narain[1] in his book *Indian Economic Life* (Lahore, 1929). Indian records for this period are extremely scanty; but after searching Europe he obtained some interesting records of Dutch and Portuguese navigators of that period, recounting the prices they paid for supplies. The prices expressed in their coinage are all re-expressed in terms of the silver rupee, which at that date contained about $2\frac{1}{2}$ times the silver content of the contemporary English shilling.

His results are most conveniently expressed by measuring the quantities of different commodities obtainable for one rupee, re-stating each in terms of the number of O.U. exchangeable for one rupee, and then taking the median. In the late sixteenth century, Akbar's period, the median of these data indicates a purchasing power for the rupee of 45 O.U. For the early part of the seventeenth century, Jehangir's period, we have more abundant data, 25 in all. Subdividing these, we find that the median purchasing power of the rupee over cereals was 24 O.U., over livestock products 95 O.U. This remarkable relative cheapness, as compared to the present day, of livestock products is in itself evidence of a much more productive and better-fed community; and these products must have formed a much larger proportion of the diet than they do now. Over all, we give the rupee a purchasing power of 45 O.U.

[1] It is a matter of grief to Hindus and Moslems alike that this distinguished scholar, and prominent citizen of Lahore, was murdered in the religious riots of 1947.

Brij Narain also gives a table of wages for different types of labour, which we can re-express in present-day rupees by use of the above coefficients. These compare with Atkinson's figures for 1895, probably the lowest point, and the present day. Though a considerable improvement has been shown over the last half-century it appears that real wages are still only between one-third and a half of what they were under Jehangir, and Professor Mukerjee's claim is fully justified.

TABLE XLVI

Average Wage per Month in O.U.

	Akbar's Period	Jehangir's Period	1895	1953
Slave	34	..	..	..
Unskilled farm labourers	67	87	24	48
Watchmen, urban labourers	101	131	32	55
Carpenters	203	262	57	82
Superior skilled workers	236	284	78	97
Highest palace staff	..	400	..	..

If we carry the study further back, we get more striking results still. Morland was of the opinion that real incomes in the sixteenth century were about the same as they had been in the fifth century. But Dr. Pran Nath in his book, *A Study of the Economic Condition of Ancient India*, gives for the eleventh century the annual wages payable to a number of workers, measured in kalams, each of $3\frac{1}{2}$ maunds of rough rice, or 40 O.U. On this reckoning, the average monthly wage, in O.U., was as follows:

Unskilled labourer	130
Barber	170
Carpenter's assistant	250
Skilled workers	330
Jewellers and master carpenters	500
Administrative officials	670

These are substantially higher than the real wages of Jehangir's period. This conclusion is by no means improbable.

China

Mr. Pao San Ou[1] estimates that China in 1933 had a non-agricultural product of 7·7 billion Chinese dollars. Of this, however, only 2·3 billions represent the product of manufacture, mining and building. Transport and communications represent 3·46 billions, professions and public administration 0·95 and the rent of dwellings 0·93.

The Chinese dollar in 1933 had an exchange value of 0·589 Rs. of that date, which can be equated to 2·65 O.U. Raising the product of manufacture, etc., by 25 per cent to allow for distribution, and including 0·4 billion Chinese dollars as the work done in distributing imports, we obtain a product of 3·27 billion Chinese dollars or 8·7 billion O.U. This represents 20 O.U. per head of the population as Mr. Pao San Ou estimated it. (His estimate of the numbers of craftsmen, etc., probably depended upon his estimate of the total population, which should therefore be retained.)

A table of farm production will be given later. It is found to vary enormously between regions, ranging between 85 O.U. per head for the poorest to 175 for the richest. Personal and professional services can be estimated as in India at 20 O.U. per head.

Before allowing for housing, we therefore have a total income ranging from 125 to 215 O.U. per head according to regions; including housing, ranging from 133 to 228 O.U. per head.

An alternative method of valuing the Chinese dollar in 1933, by measuring the quantities of grain for which it could exchange and expressing these latter in O.U., gives it a considerably higher value, 3·9 O.U.

Great Britain

The first estimate of English national income was made for the year 1688 by Gregory King, Lancaster Herald, and Secretary to the Commissioners for Stating the Public Accounts. A full account and critique of King's estimate, and revaluation to 1913 prices, is given in *National Income*

[1] *Journal of Political Economy*, December 1946.

and Outlay. Gregory King was remarkably modern in his concepts and his results may be accepted as substantially true.

Comparisons given in *National Income and Outlay* show that the price-rise between 1688 and 1913 was 3·23-fold on 1688 weights, or 2·82-fold on 1913 weights. The rise in prices 1913–30 was 1·74, making the rise between 1688 and 1930 about 5·3-fold. It is possible that the value of money was rather less, i.e. seventeenth-century real income was also rather less, than is given here. D'Avenel makes the price-rise in France 2⅓-fold from the last quarter of the seventeenth century to 1895, or 2½-fold to 1913. Other writers find the value of money in the late seventeenth century at four or at the most five times that of the 1930s. It is probably better to allow money a purchasing power in 1688 about two and a half times the 1913 level.

We are now confronted with a conflict of evidence. Professor Bowley's index of retail prices (*Wages and Income*, page 121) goes back to the period 1850–54, for which date he finds retail prices only 2 per cent below those of 1913. Index numbers of wholesale prices can be used to carry the data back further to 1790, for which year wholesale prices were not very different from the 1850–54 level. Are we not therefore bound to conclude that the whole two-and-a-half-fold price-rise took place between 1688 and 1790?

According to Lord Beveridge, we can do no such thing. His evidence (summarised by Professor Michel, *Canadian Journal of Economics and Political Science*, February 1946), taken by decades and interpolating for the single year, 1790, from the Jevons index, shows that prices in 1790 were only about 3 per cent higher than in the decade 1680–89. Prices in the decade 1730–39 (to which we shall have to refer shortly) were also, according to Lord Beveridge's figures, 2 per cent lower than those of the decade 1680–89.

On the other hand, Dr. Rufus Tucker (*Journal of the American Statistical Association*, March 1936) calculates a continuous index of the cost of living in London back to

1729. Taking 1913 as a base, we find the cost of living in 1850–54 was 6 per cent higher (as against Bowley's 2 per cent lower), but in 1790 was only 88 and in 1730–39 only 61. Dr. Tucker's index, carried back along this trend, might have stood at about 40 in 1688, agreeing with our other data ; Lord Beveridge's index certainly does not.

It appears that either Lord Beveridge or Dr. Tucker must be seriously wrong, because their evidence is in direct conflict. If Lord Beveridge is wrong, Dr. Tucker's index number is not incompatible with the previous estimate of the purchasing power of money in 1688. If we keep this estimate for 1688, can it be reconciled with Lord Beveridge ? Yes, but only if we assume that the movements of wholesale price index numbers between 1790 and 1850–54 were quite unrepresentative of the movement of retail prices during that period, because the rent and service elements in the cost of living rose much more rapidly than the commodity elements — we may perhaps assume.

This assumption, however, is too difficult to substantiate. To validate Lord Beveridge's index number, we have to make the general level of retail prices rise two-and-a-half-fold between 1790 and 1850–54, between which two periods the wholesale price index number showed little change. We must therefore assume that the rent and service and similar unknown elements in the retail price index not only represented a very large proportion of the whole index, but also rose with extraordinary rapidity. Such a reconciliation was attempted in the second edition of this book but does not prove satisfactory and might well be abandoned.

A choice between Lord Beveridge's and Dr. Tucker's conflicting estimates cannot be avoided, and the authority of Professor Earle Hamilton (privately communicated) is on Dr. Tucker's side. It may be that Lord Beveridge's data refer to contract purchase prices by public institutions which, under the law or custom of those days, may have been widely different from those prevailing for the ordinary buyer in the open market.

Let us examine, finally, two further pieces of evidence

which make it difficult to postulate a rapid rise in the rent and service elements in the cost of living between 1790 and 1850–54.

Dr. Tucker shows the cost of living in 1839 to have been about 10 per cent higher than in 1859. This figure is very closely confirmed in the contemporary estimate by Chadwick (*Journal of the Royal Statistical Society*, 1860). There is some difference in the composition of their index numbers; Chadwick finds food prices 22 per cent higher in the earlier year, and other prices about stationary; Tucker shows a smaller difference between the two years in food prices, and some difference in the price of other commodities; but the general trend is confirmed.

Rents and the cost of building also cannot be postulated to have shown so rapid a relative rise. Some very interesting studies by Mr. and Mrs. Hammond (in *The Bleak Age*) show that in Manchester in 1842 the cost of constructing the cheapest type of house was about £96. This was the "back to back house", covering only sixteen superficial yards, a type of structure long since prohibited. The prohibition of these poorest types of construction was discussed in Parliament that year, and it appeared that such a prohibition would raise the average price to £119. A better type of house of the sort usually leased to skilled artisans, then cost £141 to construct; under the improved standards proposed in Parliament, the cost would rise to £179. The "back to back house" had been prohibited by 1913, and the cost of construction of the cheapest type of house built in that year was quite comparable with the cost quoted for artisans' houses in 1842. (The rent charged for a "back to back house" in Manchester in 1842 was given at between two and three shillings per week, the owner paying municipal rates and cost of maintenance. This represents a gross return of 7 per cent on the original construction cost, higher if the owner had purchased the structure at a depreciated price. Even so, it is not a very high gross return, if rates and maintenance have to be paid out of it, and is probably comparable with the rents paid for similar accommodation in 1913.)

Sir Robert Giffen (*Journal of the Royal Statistical Society*, 1883) estimates that average rents at the time he wrote were 12s. 6d. per week, in 1833 5s. But these figures apparently represent the average rents paid by all classes of the community, and by the latter year there was a much bigger proportion of higher-priced houses.

A recent study by Professor Ashton shows that the prices of brick and timber rose sharply after 1790, and for the decade 1801 to 1810 were about twice what they had been in the earlier year; after the end of the Napoleonic War the fall was moderate, and by the 1820s they appeared to have settled down at about 80 per cent above the level of 1790. It is true that this is a greater rise than Dr. Tucker's index number in general, which only shows a rise of some 30 per cent over the same period, and perhaps entitles us to put prices of 1790 somewhat lower, relative to those of 1850–54 or 1913, than we have done so far.

There is another respect in which we might lower Dr. Tucker's index for 1790, as compared with 1913. Mrs. Gilboy (*Wages in Eighteenth-Century England*) examines retail prices of clothing in Somerset about 1790. For shoes and stockings, prices are at about half the 1913 level; but for men's coats and breeches, and for women's gowns and petticoats, only about one-quarter of the 1913 level. (This disparity is interesting and not surprising; in the production of shoes and stockings, more mechanisation was introduced during the nineteenth century, and hence the price rose less rapidly than in the production of other clothing.) Dr. Tucker, on the other hand, puts clothing prices in 1790 16 per cent above those of 1913, doubtless through relying on the prices of materials before making up.

Clothing has a weight of 14 per cent in Dr. Tucker's index at this period. Rent is not covered directly by him, but if we included it we should probably give it a weight of about 15 per cent. Combining our amendments for rent and clothing, we may say that while Dr. Tucker's index shows prices in 1790 to have been 88 on a 1913 base, we should perhaps reduce this figure to about 75. But after that we have to go with Dr. Tucker in estimating a steady

upward trend all through the eighteenth century, to take us back to our figure of 40 for 1688.

Another contemporary estimate has already been mentioned in connection with rents, namely Sir Robert Giffen's study published in 1883. He used some interesting data, for 1880 and 1830, of costs per head in St. George's Hospital. He puts cost of food 10 per cent above 1880 in the earlier year, whereas Dr. Tucker only puts it 5 per cent higher. The cost of fuel and light, according to Dr. Tucker, was some 44 per cent higher in 1830; 175 per cent higher according to Sir Robert Giffen. In this same article, Giffen estimates that average money wages doubled between 1833 and 1883. But he says that staff costs per patient in the hospital only rose 70 per cent over the same period. Dr. Tucker's wage index only rose 35 per cent.

To make national income comparisons before 1870, we take as our starting-point the index number in the main table, which shows 1870 prices as 2 per cent above those of 1913, and carry the index back by Dr. Tucker's figures. It is assumed that, for reasons given above, his figure requires to be reduced by 15 per cent in 1790, and that it is correct for 1854, the discrepancy being interpolated linearly between those two dates.

It is also assumed that working population is 45 per cent of the total population. This proportion may appear high, but it is borne out by the census figures for Great Britain up to 1871, and for Ireland up to 1901.

After conversion to 1913 prices, values are then re-stated in international units, on a conversion factor of 9·16 (based on the evaluation of all home-produced income in that year) for the 1913 £.

The imposition of income tax provided material for Rev. Beeke's estimate of 1800, and a further estimate (after a decade of rapidly rising prices) was made by Colquhoun [1] in 1812.

[1] Colquhoun's results were burlesqued in a pamphlet published by a Birmingham Co-operative Society entitled *The People's Joint Stock Company, Wealth Producers*:

"According to Colquhoun, we find that in 1812 the annual income of the people of Grëat Britain and Ireland, from all sources, was about four hundred and

We must first disentangle the figures for Ireland (not only for these earlier years, but also since 1860). Ireland shows not only a very different level of income per head from Britain, but also a very varying proportion of the total population.

In pounds of 1913 purchasing power, per head of the Irish working population, Colquhoun's figure is £35, the same per head as Great Britain, and therefore obviously too high. McCulloch's figure of only £14 on the other hand is fairly clearly too low (he allowed only £9 millions for all non-agricultural incomes in Ireland) and the true figure might be estimated at £18. Baxter's figure for 1847 is higher per head than in Great Britain and should obviously be omitted. The next useful figure is that given for 1883 by Sir Robert Giffen, in *Economic Inquiries and Studies*, which works out at £34 of 1913 purchasing power per head of the Irish working population.

For 1911 Bowley and Stamp estimated that social income in the twenty-six counties of Southern Ireland per head of the occupied population was £51 (as against £106 for the rest of the U.K.), or £54 at 1913 prices. Professor Duncan's figures for Eire for 1926 show an income of £118 per occupied person, equivalent to £65 at 1913 prices.

If we assume that real income per head in Ireland remained at the 1837 level until 1846, and that subsequently (owing to the great emigration which followed the famine, leading to reduction of pressure of population upon

thirty millions of pounds sterling, and was distributed amongst the various classes of which the community is made up in something like the following proportions:

First. To the Government, including the Army, Naval and civil establishments, about two and a quarter millions of persons for keeping the people quiet, 56 millions sterling.

Second. To ministers of religion and school masters for teaching the people passive submission and non-resistance 'to the powers that be', and to stage players for amusing them with vain shows, 325,000 persons, 12 millions sterling.

Third. To 1,800,000 idlers for doing nothing, or worse than nothing (setting a bad example), one hundred million sterling.

Fourth. To three three-quarter millions of merchants, shopkeepers, hawkers, pedlars, etc., one hundred and sixty-two million sterling for buying cheap and selling dear.

Fifth. And lastly to nine million of wealth producers by whose labours the whole has been created, 100 millions of pounds."

agricultural resources), rose steadily at the rate of 1·67 per cent per year, we shall obtain quite a good fit to the data for 1883, 1911 and 1926. Equating the purchasing power of the 1913 £ to 9·25 I.U., we obtain the following figures for Irish working population and aggregate real income, to be eliminated from the preceding tables :

TABLE XLVII

	Occupied Population (47 per cent of Total *), millions	Aggregate Real Income, million I.U.
1801–10	2·65	425
1822	3·26	543
1841	3·85	640
1843	3·89	648
1847	3·60	600
1858	2·83	575
1860–69	2·66	598
1870–76	2·51	626
1877–85	2·43	719
1885–93	2·25	759
1894–1903	2·11	836
1904–10	2·08	950
1911–13	2·05	1014
1913	2·04	1026
Northern Ireland only :		
1926	0·57	358
1936	0·58	430

* Ratio based on Bowley and Stamp's figure of 1·45 millions in 1911 and Giffen's figure of 2·38 millions in 1883.

The figure of 9·25 I.U. to the 1913 £ is slightly higher than that adopted for Great Britain, as Irish prices were a little lower.

The conclusions from the table are rather striking, and Dr. Tucker's wage data confirm the national income analysis. The eighteenth century, whatever its cultural and political achievements, appears to have been a period

[contd. on p. 218

TABLE XLVIII

Real Income and Wages Prior to 1870

	Year	Price Factor, 1913 Base	National Income, £ million			Real Income in Millions of I.U.		Income in I.U. per Head of Occupied Population, Great Britain	In Pounds of 1913 Purchasing Power	
			Great Britain	Ireland	United Kingdom	United Kingdom	Great Britain		Wages in London ‖	Agricultural Wages (England and Wales) Average
Gregory King	1688	40	..	..	..	..	..	456 *	..	..
Dr. Tucker§	1729	55	..	..	..	..	..	..	64	28
	1775	70	..	..	..	..	..	..	53	30
Beeke, *Produce of the Income Tax*	1801	119	218	..	..	..	1685	350	37	20
Levi [1]	1801–10	116	..	..	300	2380	1955	237	41	30
Colquhoun	1812	145	290	140	430	2720	2250 ‡	405	40	25
Lord Liverpool (quoted by Baxter)	1822	96	..	..	250–280	2530	1987	306	57	26
MacCulloch	1837	99	297	48	345	..	2740	348	52	27
Levi and Baxter	1841	106	..	..	450	3880	3240	..	48	..
Giffen, *Economic Inquiries and Studies*	1843	92	..	..	515	5150	4500	369 †	56	..
Smee [2]	1847	110	370	170	540	..	3070	..	47	23
Levi, *loc. cit.*	1858	97	..	..	600	5680	5105	504	58	31
Baxter, *The National Income*	1868	111	..	..	814	6730	6120	~~585~~	58	..
Prest	1870	..	..	..	..	8720	8100	750	64	31

[1] *Journal of the Royal Statistical Society*, 1884, p. 7.
[2] *Journal of the Royal Statistical Society*, 1847, p. 153.

* England and Wales.
† 1841 and 1847 data.
‡ Colquhoun's apportionment to Ireland revised.
§ Index results back to 1790 as described in text for earlier years, adjusted 15 per cent in 1790.
‖ Average of craftsmen and labourers, as given by Mrs. Gilboy. This series links satisfactorily to Dr. Tucker's.

Further Notes on Table

Details of Beeke's Estimate for 1800
(£ million)

Rent of farmlands	20·0	+8·5 for Scotland
Farmers' income	15·0	
Tithes	2·5	
Mines, timber and canals	4·5	
Dwellings and other buildings	10·0	
Overseas possessions		4·0
National Debt interest		15·0
Profit on foreign trade		8·0
Shipping income		2·0
Home trade (wholesale and retail)		18·0
Wages, salaries and craftsmen's incomes		110·0
		217·5

Details of Baxter's Estimate for 1868
(£ million)

Agriculture	166
Manufacture and mining	300
National Debt interest	20
Foreign income	14
Rent of dwellings	60
Domestic service	36
Other services	218
	814

of economic decline for the mass of the English people; and the first half of the nineteenth century, with all the tremendous changes brought about, only just succeeded in maintaining real income per head constant.

We can now indeed comprehend the full truth of the terrible words which John Stuart Mill, just as the mid-point of the century was approaching, wrote in the third edition of his *Political Economy*: "Hitherto it is questionable if all the mechanical inventions yet made have lightened the day's toil of any human being. They have enabled a greater population to live the same life of drudgery and imprisonment, and an increased number of manufacturers and others to make fortunes. They have increased the comforts of the middle class. But they have not yet begun to effect those great changes in human destiny, which it is in their nature and in their futurity to accomplish."

CHAPTER IV

THE VALUATION OF REAL NATIONAL INCOME IN SOVIET RUSSIA

In evaluation of real national income[1] Soviet Russia presents a special case, for many obvious reasons. Though there may be arbitrary elements in the price structure in a number of countries, most prices in other countries do bear some relation to the money costs of production incurred. This is not the case in Soviet Russia.

The outstanding factors distorting any attempt to measure real national income in Soviet Russia by normal means are:

(*a*) A variable but substantial proportion of all agricultural output is requisitioned by the Government, as taxation or at low prices.
(*b*) Over some (but not all) of the period under observation rationing has prevailed, the scope of which has varied; the same article often being sold simultaneously at low rationed and at high un-rationed prices.
(*c*) The levying of an enormous turn-over tax, designed to fall particularly heavily on food consumption, and constituting more than half of total retail turn-over.
(*d*) The rapid rise in money wages and prices throughout most of the period.
(*e*) The virtual exclusion of imports, leading to very high cost production of certain commodities.
(*f*) The choice, throughout most of the period, of 1926–27 as the base year for official statistics of industrial production and of real national income; certain manufactured goods, sold in small quantities at very high prices in that year, subsequently showed a rapid

[1] The author is grateful to Dr. Jasny, Mr. Nove, Mr. Wiles and Mr. Radice for very numerous suggestions and criticisms.

expansion of production, thus giving the index a very strong upward bias.

These difficulties can be resolved, but in the course of so doing it will be necessary to examine certain features of the Soviet economy, such as public finance, retail distribution, industrial production, etc., much more closely than has so far been necessary in other countries.

A large part of the food produced is consumed on the farm by peasant families. For this reason alone, quite apart from difficulties of measuring the effects of rationing and price differentiation in the towns, the value of food consumption must be measured by applying U.S. retail values to the quantities of total output.

In the first instance, direct determinations of real national income are attempted for the years 1913, 1928 (the last year of the comparatively liberal "New Economic Policy" before the commencement of the first Five-Year-Plan), 1932 (after its disastrous failure), and for various more recent years.

The first step is the evaluation of food consumption, including all services of transport and distribution, whether actual or imputed, i.e. valuing in I.U. at retail prices.

TABLE I

FOOD CONSUMPTION [a] (millions of I.U.)

	Value per Metric Ton in I.U. at Retail Prices	1913 [s]	1928	1932	1934–37	1938	1950	1951
Grain [c]	165 [b]	6,025 [d]	6,140	5,450	6,260	7,050	8,440	7,890
Potatoes	66	1,176 [f]	1,302 [f]	1,470 [g]	1,920 [h]	2,000 [h]	2,400 [h]	2,425 [h]
Meat and lard	600	2,085 [q]	2,550 [i]	630 [j]	1,643 [k]	1,733 [l]	..	1,591 [m]
Poultry and rabbit meat	730	(200)	220	140	(250)	330	..	(350)
Milk and milk products	100 [n]	2,320 [q]	3,011	1,962	2,259	2,600	..	2,500 [o]
Fish	450	(300)	430	600	712	688	..	(800)
Sugar	140	188	171	115	278	353	381	449
Eggs	33 [p]	220 [q]	350	140	190	280	..	300
Total of above	..	12,514	14,174	10,507	13,512	15,044	..	16,305
I.U. per head [r]	..	90·3	93·6	66·4	83·6	89·1	..	80·4 [s]

[Notes for Table I on opposite page

It will be necessary later to show (for 1951) a separate record of food consumption by the urban population (in order that we may place a rouble value on it and deduct it from the rouble total of retail sales, so that we can ascertain the value of urban non-food consumption). It is not always permissible to assume that urban consumption per head is the same as the national average. As well as the sources quoted in the above table, we have some data from Czechowicz (*Weltwirtschaftliches Archiv*, April 1932).

NOTES FOR TABLE I

Data (where not elsewhere specified) from Jasny, *The Socialized Agriculture of the U.S.S.R.*

[a] See also Jasny, *International Affairs*, October 1952; a careful estimate is made of the amount of grain required by livestock, for seed, for industrial use, and for waste in storage.

[b] 1 lb. of grain yields about 1½ lb. bread in Russia (high extraction of flour and high water content of bread) but only about 1 lb. in Western countries. The I.U. value of 1 lb. of grain should, therefore, be equated to the 1925–34 price per lb. of bread in U.S. (0·085). As, however, a good deal of this may be rye bread, and in Sweden (where both types of bread are freely sold) rye bread is 20 per cent cheaper than wheat bread, a coefficient of 0·075 is used.

[c] Including net additions to stock of grain or livestock. For national income accounting, it is more convenient to include them here than to make a separate entry for them. Exports not included.

[d] Jasny's figure for 1909–10 to 1913–14 average raised by 2·7 per cent (1¼ years' population growth).

[e] Territory of post-1921 U.S.S.R.

[f] For 1928, Gosplan estimates of per head consumption (71 k. urban, 142 k. rural) quoted by Jasny, *loc. cit.* p. 591. Urban consumption represented 1·92 million tons out of total marketings of 2·69 million tons. In 1913 marketings were 4·73 million tons, and it is assumed that both rural and urban consumption per head were higher in the same proportion.

[g] Official estimate quoted by Jasny, p. 593.

[h] Assumed 180 k. per head. Prof. Baykov (Birmingham University Russian Department *Bulletin*, December 1949) gives deliveries of potatoes per head of the urban population as 220 k. in 1938 and 144 k. in 1939.

[i] Including an allowance for increase in livestock numbers of 1·9 million horses, 2·5 million cattle, 2·8 million pigs, 7 million sheep and goats, equated to 638 million k. meat deadweight.

[j] Changes in livestock numbers taken as the mean for 1931–32 and 1932–33 (years ended June), i.e. horses decrease 4·8 millions, cattle decrease 4·75 millions, pigs decrease 1·15 millions, sheep and goats decrease 13·75 millions, equated to 1087 million k. meat deadweight.

[k] Average increase per annum over the period 1934–37 inclusive in numbers of livestock, in millions: horses, 0·2; cattle, 4·35; pigs, 3·55; sheep and goats, 7·5; equated to 651 million k. meat deadweight.

[l] Increase in numbers of livestock in millions: horses, 0·9; cattle, 3·0 decrease; pigs 5·2 decrease; sheep and goats, 0·9; net decrease equated to 419 million k. meat deadweight.

[m] Including a negative allowance (approximate) for declining livestock numbers.

[n] The I.U. value of milk sold as such is 137·5 per ton. The same weight of milk converted to butter or cheese is worth 48 or 73 I.U. respectively (more, however, if we assume that some of the buttermilk or whey is available for human consumption). The factory output of butter in 1952 was 382,000 tons (Prof. Baykov), corresponding to some 8 million tons of milk or nearly ⅓ of the total available supplies. Allowing for home-made butter (now probably on a small scale) and for cheese, with some offset for buttermilk, we fix a value for all milk output of 100 I.U. per ton.

[o] Khruschev's recent statement gives the number of cows in 1953 at 24·3 millions. The national average yield per cow was recently published in an official paper in one of the remoter provinces at 1027 kilos (the planned yield on the State farms in 1941 was only 1130 k.), giving 25 million tons.

[p] Per thousand.

[q] Czechowicz, *Weltwirtschaftliches Archiv*, April 1932.

[r] To these should be added about 10 I.U. per head to cover other foods, mostly fruit and vegetables, but also including about 1·5 I.U. for vegetable oils and a small entry for tea. In comparing these figures with other countries it should be remembered that they are at retail values.

[s] Whole population taken at 203 millions.

It must be remembered that the changes in these ratios represent not only any increase or decrease in the

TABLE II

RATIO OF URBAN TO NATIONAL AVERAGE CONSUMPTION PER HEAD

Meat		Milk and Milk Products		Vegetables	
1913	2·3	1913	1·4	1928	0·8
1928	1·9	1928	1·05		
1932	1·6	1932	0·8		
1937	1·8	1937	1·1		
Potatoes		**Grain**		**Eggs**	
1928	0·55	1913	0·85	1928	1·9
1938	1·0	1928	0·85		
		1932	0·85		
		1938	0·9		

relative privileges of the urban population, but also the increasing proportion which the urban population constitutes of the whole. On the basis of these trends the following estimates of urban consumption per head are made for 1951.

TABLE III

	Kilos per Head per Year	
	National Average	Urban
Grain	235	225
Potatoes	180	180
Meat and lard (including poultry and rabbit meat)	16	24
Milk and milk products (expressed as milk)	125	125
Fish	9	12
Sugar	16	20
Eggs (number)	50	75
Vegetable oils	5	8

We can next measure, in real terms, the consumption of housing space. The basis used for international

comparison of rents is a dwelling of 3–5 rooms rented at \$8·47 per room per month in U.S.A. in 1929 with private bathroom, closet and running water, or \$7·47 without these amenities. On the American rent index this corresponds to \$7·01 over the period 1925–34, i.e. 7·01 I.U. per room per month. The average room may be taken at 16 square metres, and the value of 1 square metre at 5·26 I.U. per year.

The number of square metres of floor space of urban dwellings, according to Professor Baykov,[1] was 159 millions at the Census of 1926 and had probably risen to 163 millions in 1928. According to Méquet[2] the amount of floor space available in 1924 was 20 per cent less than in 1913. The amount of floor space for 1923 is given by Professor Prokopovicz[3] at 128 millions, and the figure for 1913 can therefore be put at 170 millions. Professor Prokopovicz also gives 185 millions for 1932 and 212 millions for 1937. This latter is compatible with Professor Baykov's figure of 225 millions for 1939; during the period 1933–37 total building averaged 5·4 million square metres per annum.[4] (It is interesting to notice that Professor Baykov states that only 140 millions out of this 225 million square metres of floor space was "socialised".) Professor Baykov states that his estimate is made after some allowance for deterioration.

The plan drawn up just before the war provided for a rate of construction of 9 million square metres per annum of urban dwelling, of which as much as 2 millions were to be privately owned.

Professor Baykov claims that in 1951 27 million square metres of urban dwelling space (included private building) were constructed, together with 400,000 rural houses or another 10 million square metres. This enormous increase on the pre-war rate of building (which was only at the

[1] *Bulletin of the Department of Russian Studies*, University of Birmingham, 1953.

[2] *International Labour Review*, vol. 25, p. 621.

[3] *Bulletin from the Institute of Soviet Russian Studies*, Geneva, 1939: also in his book *Russland's Volkswirtschaft unter den Sowjet*.

[4] *Monthly Labour Review*, February 1940.

rate of a little over 5 million square metres per annum, with probably very little rural housing in addition) is quite incompatible with the figures of the supply of building material. Between 1940 and 1950 the supply of bricks only rose 30 per cent, of timber 32 per cent, and of cement 82 per cent.

It does not appear that there has been any very great relative diversion of constructional resources from industrial building to housing, and the net rate of increment of housing space now can hardly be higher than 10 million square metres per year. (It is easier to show high totals when a good deal of " rehabilitation ", often of only quite minor damage, is included.)

TABLE IV

FLOOR SPACE OF DWELLINGS IN MILLIONS OF SQUARE METRES

Year	Urban	Rural	Total
1913	170	330	500
1928	163	355	518
1932	185	355	540
1934–37	203	355	558
1938	216	355	571
1940 *	272	405	677
1944 *	206	352	558
1948 *	261	382	643
1951 *	291	382	673

New Borders.

Messrs. Bergson and Heymann (in *Soviet National Income and Product, 1940–48*) estimate the net rate of increase of housing space over the years 1944–48 at 21 million square metres per year, of which 7·5 millions were rural. Though much lower than Professor Baykov's, this figure also can only be substantiated if we assume that it contained a good deal of " rehabilitation ". These authors quote a figure of 215 million square metres for urban dwellings in 1937, and 272 million square metres (allowing for territorial changes) by 1940. We may also

accept their figure of 405 million square metres for rural housing, though this is a great deal lower than the average of 4 square metres per head estimated for the rural population by Professor Polanyi (*The Manchester School*, 1934).

The figure for rural housing is assumed to have remained unchanged from 1928 to 1938. For 1913 an approximate estimate is made.

The output of "means of production" or capital goods (including building), gross, i.e. including provision

TABLE V

Capital Goods Output in U.S.S.R. and U.S.A.

Capital Goods	U.S.A.,* 1929		U.S.S.R., 1938		U.S.S.R., 1934		U.S.S.R., 1927–28
	uantity	$ million	Quantity	$ million at U.S.A. Prices of 1929	Quantity	$ million at U.S.A. Prices of 1929	$ million at U.S.A. Prices of 1929
Cement (million tons)	28·95	271	5·7	53	3·56	33	18
Timber (million cb. m.)	75·1	1007	34·5	461	18·9	253	137
Copper (thousand tons)	460·0	584	103·0	41	64·8	26	26
Steel (million tons)	57·34	2290	18·0	702	9·56	382	170
Locomotives † (Nos.)	..	332	1,626·0	52	1,345·0	43	15
Railway wagons † (Nos.)			49,100·0	73	32,400·0	48	16
Tractors (thousands)	575·0	262	32·0	23	94·4	69	3
Motor trucks (thousands)			140·0 (approx.)	155	72·5	80	1
Electrical transformers (thousand kwh.)	76·0	600	..	10 (approx.)	2,874·0	5	1
	..	5346	..	1570	..	939	387
Total gross investment, $ billion of 1929 purchasing power	..	22·75	..	6·68	..	3·98	1·65
Total gross investment, billion I.U.	..	20·4	..	6·00	..	3·57	1·48

* Data from *Survey of Current Business* and memoranda by National Bureau of Economic Research.
† Prices in Great Britain, as given in *1930 Census of Production*, converted into dollars.

for maintenance and depreciation, can also be converted to I.U. for 1928, 1934 and 1938 as follows :

We have for the U.S.S.R. quantitative[1] data of the output (from which we must exclude exports and add imports) of the following commodities, which are exclusively used for investment or construction, namely :

Cement	Motor trucks
Sawn timber	Locomotives
Copper	Railway wagons
Steel	Electrical transformers
Tractors	

In U.S.A. in 1929 gross investment[2] in fixed capital was $22·75 billions, of which the commodities specified above constituted $5·35 billions. In default of a better method, their output in U.S.S.R. is used to estimate the total value of gross investment (including all repair and depreciation) in dollars of 1929 purchasing power, and thence in I.U.

Dr. Jasny gives the following figures for net investment :

TABLE VI

	1928	1937	1940	1948
In true 1926–27 prices correcting for bias of index numbers, billion roubles :				
As given in *Soviet Economy in the Plan Era*	4·8	22·0	24·4	27·2
Amended in corrigenda	4·8	20·0	21·5	24·5
Converted to billion $ of 1926–1927 value	1·50	5·8	6·9	7·1
Converted to billion I.U.	1·36	5·3	6·3	6·5
Deduced gross investment, billion I.U.*	1·50	6·75	8·5	8·1

* Deduced from ratios given by Kaplan in *Soviet Economic Growth*, p. 45.

Dr. Jasny's method gives a result identical with the ormer method for 1928, but some 20 per cent higher for

[1] *Handbook*, pp. 146 *et seq.*

[2] Professor Kuznets's estimate from *National Bureau of Economic Research Bulletin*, 52, p. 6. Defined *inclusive* of all parts, repair and service work (which are excluded from the current official estimate of gross investment).

1938. This discrepancy is not surprising. A gradually increasing proportion of more highly fabricated capital goods, from the same volume of basic constructional materials, is quite a plausible hypothesis.

Taking real gross investment of 8·5 billion I.U. in 1940 as our base, we can establish figures for other years from Mr. Nove's study.[1] He advances circumstantial evidence for an 80 per cent increase between 1940 and 1951. For other post-war years, he shows that the trend of the official index of volume, and of Dr. Jasny's independently calculated index, are very similar.

TABLE VII

REAL GROSS FIXED INVESTMENT IN BILLIONS OF I.U.

1946	1947	1948	1949	1950	1951	1952
6·8	7·5	9·2 [2]	11·1	13·7	15·3	17·0

A recent official statement indicated that the volume of investment in 1953 was 4 per cent higher than in 1952, or 17·7 billion I.U.

These results are not incompatible with available information about the current rouble value of gross fixed investment, if we accept an estimate that has been made, that in 1950 the purchasing power of the rouble over investment goods was about 6 to the U.S. $. (The general ratio for converting 1950 dollars to I.U., as stated above, was 1·649 $ to the I.U.: but in the case of construction, which constitutes about two-thirds of all gross investment, the purchasing power of the dollar was much lower.)

We are now in a position to enumerate, in I.U., the growth of capital, its annual requirements for depreciation and maintenance, and net investment. Gross investment has been defined in the grossest possible manner, to include all kinds of repair work — so far as urban capital is concerned. The stock of rural dwellings, farm buildings,

[1] *Review of Economics and Statistics*, February 1954.

[2] This is higher than the figure in the previous table. Mr. Nove considers that all Dr. Jasny's post-war figures are a little too low.

growing crops and livestock, as it existed in 1928, is excluded from the calculation. The maintenance of such capital depends upon peasants' and craftsmen's labour, and on locally produced materials, and does not draw upon the fund of resources available for gross investment as we at present define it. We will include, however, the capital value of agricultural implements and irrigation works as they were in 1928 and investment after 1928 in new types of agricultural machinery.

The war-time loss of capital (less capital gained in annexed territories, from reparations, etc.) is taken[1] at 20 per cent of the 1941 capital.

The stock of capital on 1st July 1928 has been stated[2] at 49·4 billion roubles in 1933 prices, or 140 billion roubles in 1945 prices, each of which is equivalent to some 17 billion I.U. This includes[3] 8·0 billion roubles of livestock and 16·9 billion roubles of farm buildings and improvements, at 1925–26 prices. It appears that the "1933 prices" officially used for capital goods did not differ greatly from those of 1925–26, and were if anything a little lower, so we equate this rural capital to 6·7 I.U., leaving a capital stock of 10·36 I.U. in mid-1928, or 9·7 at the beginning of the year.

Messrs. Bergson and Heymann[4] quote allowances officially fixed in 1938, of 5·5 to 6 per cent for depreciation, and 2·2 to 3 per cent for repairs. Mr. Kaplan, in *Soviet Economic Growth*, thinks that a 4 per cent depreciation allowance should be sufficient (result obtained by compounding 10 per cent on equipment and 2 per cent on buildings) but makes no allowance for repairs.

Professor Prokopovicz[5] was of the opinion that "depreciation" (apparently in this case the entry was intended to cover maintenance also) in 1929–30 should

[1] This hypothesis leads to much the same result as the hypothesis of Messrs. Bergson and Heymann, that capital stock of 1948 was a little below that of 1940, when we define the 1940 figure *inclusive* of the newly annexed territories.

[2] *Soviet Economic Growth*, p. 49.

[3] Figures quoted by Dr. Jasny from First Five-Year Plan.

[4] *Soviet National Income and Product, 1940–48*, p. 191.

[5] *Bulletin of the Institute of Russian Research of the University of Birmingham*, 1931.

be allowed at 3 billion roubles, corresponding to about 2 billion roubles for 1928, or 0·56 billion I.U. — some 5 per cent of the estimated capital stock. However, much of this capital represents housing, railways and other forms of investment to which low rates of depreciation would apply. " Productive funds of large-scale industry " — the form of capital on which higher depreciation rates would apply — only amounted [1] to 8·1 billion roubles of 1926–27 value in 1925, and was increasing very slowly. (In 1913 this had been 3·5 billions at current prices, or also about 8 billions at 1928 prices, if we use wage rates as a conversion factor.) The U.S.A. in 1929 [2] had a capital stock (defined as above, and excluding agricultural capital) of $247 billions, on which charges for depreciation and accidental damage [3] were $8·0 billions to which we should add Mr. Fabricant's estimate of $1·2 billions for depreciation on governmental property, making in all a total of $9·2 billions, or 3·7 per cent. Repair and maintenance work as estimated by Professor Kuznets was some $6 billions, or a further 2½ per cent.

TABLE VIII

	Building and Construction			All other Capital		
	1907	1924	1930	1907	1924	1930
Repair and maintenance,* £ million	49·5	124	153	51·6	118·5	106·5
Do. at 1913 prices	49·5	56·2	69·6	51·6	59·2	53·2
Stock † of capital at 1913 prices, £ million	3160	3519	3919	4346	4910	5141
Maintenance percentage	1·6	1·6	1·8	1·2	1·2	1·0

* *National Income and Outlay*, p. 178.
† E. H. P. Brown, *Economic Journal*, June 1953. Valued at replacement cost.

Full statistics of all repair and maintenance work on capital equipment are compiled by some countries and not by others — Britain, for example, has just *ceased* to include all repair work in gross investment. An examination of some past years is of interest.

[1] Baykov, *Development of the Soviet Economic System*.
[2] Goldsmith, *loc. cit.* [3] *Survey of Current Business*, July 1952, p. 14.

There is some indication, however, that in these years many business firms performed an unusually large proportion of repairs themselves, and the value of the work was, therefore, not included in the Census of Production Statistics.

When current repairs to buildings were recently *excluded* from the official figures of gross investment, their current cost was estimated at £600 millions per annum, equivalent to about £100 millions per annum of 1913 purchasing power. The stock of buildings was valued at £4554 (of 1913 purchasing power) in 1938 and may be £5000 millions now, giving a ratio of the order of magnitude of 2 per cent.

Norway is a country which *includes* all repair and maintenance work in gross investment. Norway's capital [1] in 1939 was 31,372 million kr., or 22,261 million kr. excluding forests, farm crops and buildings and durable consumers' goods other than dwellings. The *combined* value of repairs and depreciation,[2] excluding agriculture (other than on machinery) and forestry, was 858 million kr. or 3·8 per cent. We thus find the following percentage rates on capital:

TABLE IX

	U.S.A.	Britain	Norway
Maintenance . .	2·5	2·0 *	..
Depreciation . .	3·7	..	..
Combined . .	6·2	..	3·8

Buildings only.

For the Russian economy an allowance of 5 per cent, for maintenance and depreciation combined, is considered the best estimate.

We are now in a position to prepare, by linear interpolation, and on the above assumptions, a complete table for the period 1928–52.

[1] *Nasjonal inntekten i Norge*, pp. 126-8.
[2] *Nasjonal regnskap*, p. 131.

TABLE X

	Capital * at Beginning of Year	Billion I.U., Depreciation and Maintenance during Year	Gross Investment during Year	Net Investment during Year
1928	9·7	0·5	1·5	1·0
1929	10·7	0·5	2·0	1·5
1930	12·2	0·6	2·8	2·2
1931	14·4	0·7	3·7	3·0
1932	17·4	0·9	4·2	3·3
1933	20·7	1·0	4·7	3·7
1934	24·4	1·2	5·2	4·0
1935	28·4	1·4	5·7	4·3
1936	32·7	1·6	6·2	4·6
1937	37·3	1·9	6·7	4·8
1938	42·1	2·1	7·3	5·2
1939	47·3	2·4	7·9	5·5
1940	52·8	2·6	8·5	5·9
1941	58·7	..	..	..
1946	47·0	2·4	6·8	4·4
1947	51·4	2·6	7·5	4·9
1948	56·3	2·8	9·2	6·4
1949	62·7	3·1	11·1	8·0
1950	70·7	3·5	13·7	10·2
1951	80·9	4·0	15·3	11·3
1952	92·2	4·6	17·0	12·4
1953	104·6	5·2	17·7	12·5
1954	117·1	..	..	..

* Excluding rural buildings and livestock.

We next proceed to a revaluation in real terms of the national income of 1913 and 1928.

Exports of the Russian Empire, excluding Finland, in 1913 were 1583 million roubles, and we can more or less attribute the whole of this amount to U.S.S.R. territory. The Succession States were mostly "deficit areas" for food.

This represented £168 millions at current prices. The *Statist-Sauerbeck* index for prices of food and raw materials shows a rise of 22 per cent between 1913 and 1925–34, or 17 per cent allowing for depreciation of sterling against the dollar in 1931–33. This makes 1913 exports the equivalent of $168 \times 1{\cdot}17 \times 4{\cdot}87 = 960$ million I.U.

Of the rouble value of exports we assume 900 million roubles to represent the output of agriculture and fishing, and the remainder the net contribution of transport, commerce, manufacture, mining and forestry.

Imports were 1·37 billion roubles or $705 millions. World prices of manufactured goods rose about 40 per cent between 1913 and 1925–34, making this figure the equivalent of 987 million I.U.

Revaluation of imports is necessary because they enter into consumption prices.

In other countries where large boundary changes occurred, the 1913 national income investigations have generally referred to contemporary boundaries. But for Russia the 1913 investigation is based on the work of Professor Prokopovicz, which sets out to cover only the 1921–39 territory of the U.S.S.R. (Originally Professor Prokopovicz estimated the income of fifty provinces of European Russia only, and by estimation extended his results to U.S.S.R. territory.) His results for 1900 and 1913, and estimates of real income at 1913 prices for the years 1922–23 to 1931, were published in a memorandum (1931) issued by the Birmingham University Bureau of Research on Russian Economic Conditions.

We now have valuations in international terms of the value of exports and consumption of food and of dwelling space and we must seek methods of revaluing the remainder of the national income.

For 1913 (for the 1921–39 territory of U.S.S.R.) Professor Prokopovicz obtains a national income less depreciation of 13·06 billion roubles, or 5·56 billions excluding agriculture and fishing. He includes the current value of new building work, but makes no entry for the annual value of existing dwellings.

He also makes no entry for services performed by public authorities. Government expenditure less debt service was 2·57 billion roubles in 1913, say 3 billions including local authorities, or 2·6 billions for Russia as under post-1921 boundaries. Besides Government services he also omitted the value of all service industries other than

commerce, transport and communication (i.e. professional services, hotels, domestic service, etc.). But for pre-revolutionary Russia a proportion somewhere between 5 and 10 per cent of money national income appears to be indicated.

To obtain figures on a market price rather than factor cost basis we must include the proceeds of indirect taxation and State monopolies, namely 2·0 billion roubles for the Russian Empire,[1] or say 1·7 billions for U.S.S.R. territory.

	Billion Roubles	
Recorded net national income .	13·06	
Do., less agriculture and fishing .	..	5·56
Addition for service industries .	..	1·1
Addition for indirect taxation .	..	1·7
		8·36

Of the above, some 0·68 billion roubles of non-agricultural output has already been valued in exports, leaving a balance of 7·68 billion roubles, or 9·05 billion roubles including imports, to be revalued.

Evidence of the purchasing power of the rouble in 1913 can be obtained from certain non-food retail prices. For the three Succession States of Poland, Finland and Estonia we have comparisons with U.S. retail prices for 1929.

TABLE XI

COMPARISONS AT CURRENT RATES OF EXCHANGE

U.S. Prices, 1925–34 = 1

Item	U.S. Prices, 1925–34	U.S. Prices, 1929	Succession State Prices, 1929		Deduced Russian Prices, 1913
Clothing .	1	1·110	Poland	·86	·60
			Finland	·99	·72
Fuel . .	1	1·022	Poland	·84	·75
			Finland	·79	·41
			Estonia	·65	·68

These can be carried back to 1913 by the use of each country's index number. This should give, at any rate, some indication of the level of retail prices in other parts of the Russian Empire in 1913.

1 Dr. Margaret Miller, *Economic Condition of Russia, 1905–14.*

The exchange value of the rouble in 1913 was \$0·515 and these figures indicate a purchasing power of 0·79 I.U. Comparing U.S. retail prices of 1913 with those of 1925–34, the purchasing power of \$0·515 in U.S. in 1913 was also about 0·79 I.U. The rouble may be expected to have had a comparatively high purchasing power over such goods and services as handicraft products, wood fuel, and the labour of distributive workers. This, however, was offset by its low purchasing power over manufactured goods at wholesale.

We thus value the 9·05 billion roubles residue at 7·15 billion I.U.

The low purchasing power of the rouble over manufactured goods in 1913 may have been due to high-cost production under tariff protection, and to high costs of transport. Czechowicz (*Weltwirtschaftliches Archiv*, April 1932, p. 488), comparing the prices of a number of leading manufactured articles, finds that the purchasing power of the rouble in 1913 was only 59 per cent of its exchange value when compared with the dollar, 55 per cent when compared with the mark, 62 per cent when compared with the £, 67 per cent when compared with the French franc.[1] (Over agricultural produce, at the same date, the rouble, when compared with these four currencies, showed a purchasing power 40–57 per cent above its exchange value.)

We have, therefore, for 1913:

	Billion I.U.
Food consumption (including allowance for fruit and vegetables)	13·7
Value of dwelling space	3·16
Other consumption and investment within country	7·15
Deduct imports	−0·99
Add exports	0·96
Produced national income	23·99

÷ 1·075 to convert prices to geometric mean basis [2]

[1] G. Meyerson, *Promyshlennaya depressiya v Rosii v 1906–9* (Industrial Depression in Russia, 1906–9), 1927 (quoted by Manya Gordon, *Workers before and after Lenin*), estimates that domestic prices (presumably of manufactured goods) in Russia in 1913 were, on an average, 60 per cent higher than in England, and 70 per cent higher than in U.S.

[2] See Chapter I, p. 32.

National income at current prices in 1928 was estimated by Katz[1] at 29·9 billion roubles, of which 11·7 billions were agricultural incomes. To obtain the supply of non-food goods and services we take the residue of 18·1 billions, *add* the output of industrial crops, estimated at 0·5 billion, and deduct the transport and distributive services performed on foodstuffs, which we may put at 1 billion, leaving 17·6 billions. Next we add imports (1·0 billion) and deduct the non-agricultural element in exports (0·6 billion), giving us 18·0 billions.

Katz's figure includes 2·5 billions "profits of the socialised sector", which appear to be net, after providing for depreciation. He appears to have included the value of the services of handicraftsmen, and of small traders handling material goods, but as a good Marxian he must have excluded purely personal services, such as domestic work, entertainment, etc. — which we may estimate at 1·5 billions (Governmental services worth 2·7 billions are omitted here, as we have material for evaluating them separately). This gives us a product of 19·5 billions at factor cost, and to convert to market prices we must add a further 1·9 billions ("Trade or Craft Tax" and "Excises" as shown by Professor Baykov), making 21·4 billions in all.

Gross investment was 7·3 billion roubles and net investment 5·3 billions (Professor Prokopovicz's estimate for depreciation in 1929–30 revised — see above).

This leaves consumable goods and services, other than food and dwelling space, at 16·1 billion roubles.

The education and health services, in this and in other years, are valued by Jasny[2] in 1926–27 roubles. A teacher who received $1250 per year in U.S.A. in 1925–34 received 1250 roubles per month in 1952, and about one-tenth of that money income in 1926–27. Over such services, therefore, the 1926–27 rouble had a purchasing power of 0·84 I.U.; over industrial goods, however, only of about 0·37 I.U.; for the whole education and health services an equivalent of 0·61 I.U. is assumed.

[1] *National Income of the U.S.S.R. and its Distribution* (in Russian), 1932.
[2] Revised values in the corrigenda to *The Soviet Economy in the Plan Era.*

Regarding the Armed Forces, Professor Wyler's figures [1] are used, which express the value of their services in dollars of 1940 purchasing power, which can be readily converted into I.U.

For consumption goods and services we may use an index of non-food retail prices calculated by the Moscow Institute of Conjuncture [2] (which at that date had not yet been abolished), showing a rise between 1913 and 1927 of 112 per cent. This gives the rouble a purchasing power of 0·373 I.U. in this sphere,[3] and private consumption an aggregate value of 6·00 billion I.U.

We have, therefore, for 1928 :

	Billion I.U.
Food consumption (including allowance for fruit and vegetables)	15·69
Dwelling space	2·73
Other private consumption	6·00
	24·42
Divide [4] by factor 1·075	21·75
Net investment	1·00
Education and health	0·98
Armed Forces	0·88
	24·61

We may now consider, for more recent years, the amount of consumption of goods other than food and housing. The basic material is from statistics of retail sales, excluding food consumption.

Regarding retail sales and related transactions, Messrs. Bergson and Heymann give the following figures (billion roubles :

[1] *Social Research*, December 1946.

[2] Published by London and Cambridge Economic Service, 7th May 1928.

[3] Czechowicz (*Weltwirtschaftliches Archiv*, April 1932) finds that the purchasing power of the rouble over manufactured goods at wholesale in 1928 was only 37–43 per cent of its exchange value, when compared with the £, dollar, mark and franc. Over agricultural produce in 1928, compared with the same currencies, it had a purchasing power 29–40 per cent above its exchange value.

[4] See Chapter I, p. 32.

TABLE XII

	1937	1940	1944	1948
Retail sales by state and co-operative stores	126	175	119	330
Of which sales to non-household buyers	15	13	6	25
Sales to households in collective farm markets	16	35	50	48
Sales of services to households (other than rent of housing) . . .	14	20	12	25
	141	217	175	378

It is not easy to estimate what proportion of collective farm sales is direct to households, and what proportion is purchased by State and co-operative buyers. Mr. Nove, calculating by different methods, finds the total of cash sales to households, including services but excluding rent, to be 206 billion roubles in 1940, 352 in 1948, and 402 in 1951. His 1951 figure will be used provisionally. Some price data are available to express it in real terms.

TABLE XIII

	Urban Expenditure per Head, 1951	
	Kilos	Roubles
Grain	225	635
Potatoes . . .	180	144
Meat and lard . .	24	480
Milk and milk products (expressed as milk) .	125	288
Fish	12	174
Sugar	20	260
Eggs (number) . .	75	75
Vegetable oils . .	8	192
Total of above .	..	2248

The next step is to deduct expenditure on food (all urban food expenditure, and rural cash expenditure).

Allowing for fruits and vegetables, tea and other foods not covered, this total should be raised to about 2500 giving, for an urban population (1951) of 78 millions, food consumption valued at 195 billion roubles.

Among the rural population of 125 millions there was also considerable cash expenditure on food. In the first place non-agricultural rural workers (in transport, forestry, etc.), some 25 millions with their families, probably bought most of their food for cash, say 1500 roubles per head or 37 billions in all. The remaining 100 millions farm population certainly paid cash for their tea, sugar and fish (400 roubles per head per year if they consumed at urban rates per head, though in fact they probably consumed considerably less); but in addition they would have to buy grain and potatoes when their own crops were short, or where they were primarily engaged in the production of industrial crops (cotton, sugar beet, etc.). We will make an all-round allowance of 500 roubles per head per year, or another 50 billion roubles cash food expenditure.

We therefore have:

	Billion Roubles, 1951	
All cash sales (excluding rent) to households	..	402
Less food purchases by urban population	195	..
Less food purchases by rural non-farm population	37	..
Less food purchases by farm population	50	..
		120

By 1953, however, the figure for cash sales had risen to 444 and the deductions (with reduced food prices) had fallen to 224, giving non-food purchases of 220 billion roubles. The available prices refer to the year 1952, and will be applied (provisionally) to both the 1951 and 1953 figures.

The following price information is available from comparisons prepared by Mr. Wiles and M. Delprat, from

their observations made while attending the Economic Conference in Moscow in April 1952.

The link between pence or francs, and U.S. cents of 1950, is made on the O.E.E.C. study mentioned at the end of Chapter II.

TABLE XIV

PURCHASING POWER OF THE ROUBLE, 1952 (NON-FOOD)

		Pence or Francs of 1952	Pence or Francs of 1950	U.S. Cents of 1950	U.S. Cents of 1935–39	U.S. Cents of 1925–34
Clothing and textiles	(Wiles) *	2·4d.	1·97d.	2·58	1·38	1·65
	(Delprat) †	11 fr.	8·48 fr.	2·13	1·14	1·36
Durable goods	(Wiles) *	4·4d.	3·79d.	5·85	3·44	3·51
	(Delprat) †	33 fr.	24·2 fr.	4·57	2·70	2·75
Services	(Delprat) †	60 fr.	40·6 fr.	16·83	9·92	10·10

* *Bulletin of the Oxford Institute of Statistics*, September 1952.
† *Économie et humanisme*, 1952.

Delprat estimates the purchasing power of the rouble over drink at 5 frs. in 1952, which is equated by a process similar to the above to 1·65 U.S. cents of 1925–34. For cigarettes, by a direct comparison, the 1952 purchasing power of the rouble is equated to 3·3 U.S. cents of 1925–34.

We also have the following:

TABLE XV

PRICE OF FUELS (Wiles)

	Roubles	U.S., 1925–34 $	I.U. Value of Rouble
Coal per metric ton . . .	200	9·66	0·048
Gas per cubic metre . .	0·2	0·032	0·16
Electricity per kwh. . .	0·4	0·03	0·075
Kerosene per imp. gall. . .	3·4	0·10	0·029
			0·07

Available information on the distribution of non-food expenditure is scanty.

TABLE XVI

PERCENTAGE DISTRIBUTION OF EXPENDITURE OTHER THAN FOOD OR RENT

	Urban Budgets, 1928	Statistisches Reichsamt [1] Estimates for 1936	
		1 Earner Family	2 Earner Family
Clothing	48	44	52
Drink	6	25	16
Tobacco	3		
Fuel and light	14	18	23
Transport, recreation cultural, medical	13	13	9
Other	16		

In the light of this information, weights are imputed to the various elements in the rouble value of consumption besides food and rent. In order to make an "ideal index number" comparison, a table is constructed by which all rouble consumption can be re-stated in I.U. terms: at the same time, a hypothetical consumable income of 100 I.U. (distributed among different objects of consumption on U.S. 1925–34 experience) is revalued in rouble terms. These calculations cover food and rent (including imputed expenditure on these objects by the rural population) as well as other forms of consumption.

For food the re-weighting is carried out commodity by commodity.

Precise U.S. weights for the period 1925–34 are not conveniently available, but the weights for the period 1935–39 are not seriously different. The purchasing power of the rouble computed on American weights is as much as 27 per cent below that computed on Russian weights. This is mainly due to the relatively high prices of meat and dairy produce. (The calculation of the Statistisches

[1] *Vierteljahrshefte zur Statistik des Deutschen Reichs*, 1938, Vierter Teil.

TABLE XVII

Food Consumption (kilos per person per week)

	Russian Quantities	Value in Roubles, 1952	Value in I.U.	U.S. Quantities of 1935–39	Value in Roubles, 1952	Value in I.U.
Bread (including flour) and cereals converted to equivalents	4·5	9·0	·742	2·6	5·2	·429
Butter	0·05	1·4	·048	0·15	4·3	·145
Margarine	0·1	1·8	·024	0·24	4·3	·058
Meat	0·3	5·4	·180	1·1	19·8	·660
Potatoes	3·45	3·1	·228	1·15	1·0	·076
Sugar	0·3	3·2	·042	0·85	9·5	·119
Milk (litres)	1·5	3·3	·205	3·0	6·6	·411
Eggs (number)	1·0	0·8	·033	5·7	4·6	·188
Cheese	0·05	3·0	·035	0·05	3·0	·035
Tea	0·02	2·0	·013	0·13 *	7·8	·117
Fruit and vegetables	2·0	1·8	·150	2·0	1·8	·150
	..	34·8	1·700	..	67·9	2·388
	I.e. 0·0489 I.U. per rouble			I.e. 0·0352 I.U. per rouble		

* Coffee.

TABLE XVIII

	Billions of Roubles, 1953	Do. revalued to Billions of I.U. (on 1952 Prices)	Distribution of a Hypothetical Consumable Income of 100 I.U.	Do. revalued to Roubles of 1952 Purchasing Power
Food	459 †	18·06 *	28	796
Rent	10 ‡	3·55	15	40
Clothing	110 §	1·65	13	866
Drink	23 §	0·38	2	121
Tobacco	11 §	0·36	2	61
Fuel and light	23 §	1·61	5	71
Services	21 §	2·12	28	277
Durable goods	32 §	1·00	7	224
	689	28·73	100	2456
	I.e. 0·0416 I.U. per rouble		I.e. 0·0407 I.U. per rouble	

* National aggregates of consumption, in physical quantities, converted direct to I.U.
† Computed by applying the conversion factor of 0·0489 I.U. per rouble (previous table) to I.U. value shown in next column.
‡ For 700 million square metres of floor space, including an imputation for rural dwelling.
§ 220 billions of ascertained total expenditure apportioned according to best available information.

Reichsamt for 1936 shows, however, that at prices then prevailing the purchasing power of the rouble over food was *halved* by using German instead of Russian weights.)

The two sets of weights now give results which are quite close together — the relatively high prices of meat and butter in Russia being apparently offset by the relatively low prices of services. A valuation of real product constructed on Russian weights need, therefore, only be reduced by a factor of 1·01 to put it on a "geometric mean" basis.

Excluding food and rent, 1953 consumption, on 1952 prices, appears to have been worth 7·12 billion I.U. and 1951 consumption only 3·88 billions. If we take into

TABLE XIX

	Billion Roubles, 1936	Equivalent in Billion Marks of 1936	Equivalent in Marks of 1929	Equivalent in $ of 1929
Clothing .	26·0	5·20	7·42	2·37
Fuel and light	11·4	4·10	4·60	2·30
Other . .	14·6	6·95	8·47	2·29
Total .	52·0	..	..	5·96
	Equivalent in billion I.U. 5·51			

account the fact that there was apparently some fall in retail prices of non-food goods between 1951 and 1953, the discrepancy becomes even wider. Assuming that the fall was linearly distributed over the three years, the figures become 7·65 and 3·60 billion I.U. respectively.

For 1936 we have the Statistisches Reichsamt comparison (Table XIX). Cash sales to households (excluding rent) were 141 billion roubles in 1937 and may be estimated at 119 for 1936. Urban food consumption per head, using available price data, can be calculated at 972 roubles, or 47 billions in all, in 1936. Estimating rural retail expenditure on food at 20 billions, this leaves us a total expenditure, not on food or rent, of 52 billions in 1936. This can be converted to I.U. from the Statistisches Reichsamt study.

Dr. Jasny[1] estimates that the real volume of retail sales rose by 31 per cent between 1940 and 1950 (within actual U.S.S.R. boundaries: on comparable territory

TABLE XX

Article	Price in Roubles	English Price s.	d.
Man's suit	87·0	50	0
Boots	100·0	15	0
Peaked cap	23·0	10	0
Boy's overcoat	75·0	20	0
Goloshes	15·0	2	6
Cardigan	68·0	4	0
Underclothes	8·0	4	0
Bathing-dress	1·60	2	0
Tie	2·50	2	6
Mattress	47·0	10	0
Kerosene (litre)	0·47	0	2½
Electric bulb	1·28	1	0
Dozen pencils	2·28	1	0
Small slide rule	13·10	7	6
Saucepan	10·0	1	0
Suitcase	87·0	7	0
Camera	193·0	15	0
Toy car	78·0	25	0
Toy gun	3·40	3	0
Portable gramophone	177·0	25	0
Balalaika	20·30	30	0
Postcard	0·30	0	1
Cake of soap	5·0	0	6
Toothbrush	1·50	0	9
Lipstick	2·50 to 9·0	6d. to 1s. 6d.	
2 doz. safety-pins	0·36	0	2
Rural rough coat	20·0	50	0
Shoes poor quality	25·0	12	6
Scent	6·23	0	6

15–20 per cent only).[2] The volume of food sales rose by only about 10 per cent in all (i.e. on comparable territory showed a fall), so we can estimate that the real volume of

[1] Results published in *Quarterly Journal of Economics*, May 1952.

[2] Mr. Wiles (*Bulletin of the Oxford Institute of Statistics*, November-December 1954) estimates 17 per cent.

non-food retail sales rose by some 40 per cent between 1940 and 1951, assuming 1951 only a little above 1950. All consumption other than food and rent was valued at 3·60 billion I.U. in 1951 and may, therefore, be estimated at 2·56 billion I.U. in 1940 — a serious fall from the 1936 standard, probably explainable by war preparations.

For 1934 a considerable list of non-food prices, with their English equivalents, has been provided (Table XX) by Mr. E. C. R. Kahn (unpublished memorandum). They were collected mostly from "open shops", but also a few, in rural areas, from the co-operatives (which had not yet at that date been abolished).

Taking a geometric average of the wide range of rouble equivalents thus obtained, we get a figure of 1 rouble = 3·48 pence, or 69 roubles corresponding in purchasing power to the £ sterling.

TABLE XXI

Article	Price in Roubles	Approximate English Price	Rouble Equivalent in Pence
		£ s. d.	
Men's caps . . .	17·45	3 6	2·4
Felt hats (poor quality) .	35·50	5 0	1·7
Men's ties . . .	5·50 to 11·50	1 0	1·4
Men's brown shoes . .	72·0	10s. 6d. to 15s.	2·1
Men's canvas shoes .	50·0	5s. to 7s. 6d.	1·5
Men's winter coats (cloth)	350·0	2 10 0	1·7
Men's waterproofs . .	125·0	1 0 0	1·9
Ladies' umbrellas with Fox frame . .	80·0	12 6	1·9
Ladies' waterproof coats (rather poor quality)	125·0	10s. to 15s.	1·2
Ladies' waterproofs (silk finish) . . .	178·0	1 10 0	2·0
Ladies' coats . . .	550·0	3 10 0	1·5
	252·0	2 10 0	2·4

Mr. Michael Zvegintzov (in a private communication) has estimated that in the Torgsin shops (shops then operating to sell to holders of foreign currency) £1 would buy the equivalent of 100–125 roubles — Professor Polanyi

has estimated as high as 200. However, the Soviet Government at that time was particularly anxious to obtain foreign currency and probably offered unusually advantageous terms specially to buyers of food.

Considerable investigations were also made by Sir Walter Citrine[1] in 1935. He quotes the figures given in Table XXI.

From a Mostorg store he also quoted the following data :

TABLE XXII

Article	Price in Roubles	Estimated Price in England	Rouble Equivalent in Pence
Men's braces	3·25 to 7·45	9d. to 1s.	1·9
Playing cards	2·5 to 10·0	9d. to 2s.	3·0
Clothes brushes	6·35	6d.	0·9
Safety razor in case	6·25	1s.	1·9
Men's ties	6·25 to 4·20	6d.	1·1
Hairbrush	7·0	6d.	0·9
Hand mirror	21·10	1s.	0·6
Combs	1·90 to 2·80	3d.	1·3
Ladies' handbags	43·60	2s. 6d. to 5s.	1·0
Fibre suitcase	28·80	5s.	2·1
Pocket combs	1·24	3d.	2·9

The geometric mean of all the prices in these tables gives the rouble an equivalent of only 1·62 pence in 1935. Even allowing for an increase in rouble prices between 1934 and 1935 (retail turnover of manufactured goods rose from 23·3 to 27·2 billion roubles, probably without any great increase in real volume of consumption), this represents a purchasing power for the rouble in 1934 of only 1·85 pence.

Allowance must be made for the fact that in 1934 there was still a considerable amount of trade done through co-operatives, namely 41 per cent of the whole.[2] Mr. Reddaway has written (private communication) :

" On the whole the rate of 3½d. for a rouble spent on industrial goods may be about right. In the co-operatives

[1] Published in his book, *I Search for Truth in Soviet Russia* (London, 1936).
[2] *Statistisches Handbuch der Weltwirtschaft.*

it would be perhaps 4d. to 5d., and lower in the open market. (I would guarantee to have made a fortune by selling a complete line of English goods at open shop prices if I got 3½d. for a rouble.)"

If we construct a weighted average between Sir Walter Citrine's 1·85 pence for the purchasing power of the rouble in the open market, and Mr. Reddaway's 4½d. for the co-operatives, we obtain a general average of 2·95 pence per rouble. A figure of 3·25 pence is finally adopted for 1934 or 0·068 I.U.

For 1934 we have State and co-operative retail sales of 61·8 billion roubles, and collective farm sales of 14 billions. Deducting for sales to institutions and duplication, and adding sales of services (the two corrections about balance each other), we have a total of 76 billions. Urban food sales are calculated, in the first instance, from 1932 quantities at 1934 prices.

	Billion I.U.	Billion Roubles
Grain	1·09	3·6
Potatoes	0·38	1·4
Meat	0·51	4·2
Milk	0·45	2·1
Fruit and vegetables	0·38	1·1
Rest	0·18	2·3
		14·7

For increasing urban population, and also standards of consumption improving from the low point of 1932, we raise this result by 26 per cent in all, to 18·5 billions, or 27 billions including rural retail sales of food. This leaves all other retail sales at 49 billions, worth 3·33 billions I.U.

We can now assemble all the information on Real National Product. It is, however, defined somewhat differently from that of other countries in that no entry is made for Public Administration and M.V.D. In comparing *absolute* levels of real product of other countries, a small allowance should be made for this factor. It was deemed necessary to exclude this factor, however, because of its disturbing effect upon *rate of change* measurements.

It constitutes a much larger proportion of national product now than it did in the past, and this cannot be said to represent a genuine increase in productivity.

So far we have reviewed income from the point of view of consumers' welfare, or availability for capital investment, or military preparation. Measurement of economic

TABLE XXIII

REAL PRODUCT OF U.S.S.R. IN BILLIONS OF I.U. (INTER-WAR BOUNDARIES FOR 1913: POST-WAR BOUNDARIES FOR 1951)

	1913	1928	1932	1934–37	1937	1938	1940	1951	1953
Food consumption * (at retail prices)	13·91	15·69	12·10	15·15	16·0	16·75	17·0	18·33	18·5
Housing	2·64	2·73	2·85	2·94	2·98	3·01	3·57	3·55	3·65
All other private consumption	..	6·0	3·0 †	5·0 †	6·0 †	5·0 †	2·56	3·60	7·65
Private consumption	..	24·42	17·95	23·09	24·98	24·76	23·13 ‖	25·48	29·8 ‖
Divisor	..	1·075	1·10	1·15	1·16	1·16	1·16	1·01	1·01
Adjusted consumption	..	22·68	16·3	20·1	21·5	21·3	19·9	25·23	29·5
Net investment	..	1·0	3·3	4·4	4·8	5·2	5·9	11·3	12·5
Armed Forces ‡	..	0·88	1·5	3·25 §	4·75	5·5 §	12·5	9·4	10·9
Education and Health Services ‡	..	0·98	1·7	2·5	2·9	2·9	2·7	8·2	8·9
Net product	22·3	25·5	22·3	30·25	33·95	34·9	41·0	54·1	61·8
Per head of population	161	168	141	187	206	207	236	267	298

* Includes throughout an allowance of 10 I.U. per head of population for fruit, vegetables and minor foodstuffs.

† Interpolated from figures for 1928, 1934, 1936 and 1940.

‡ To 1940, Wyler's series for Armed Forces and Jasny's for social services. For post-war years, assumed purchasing power of the rouble 0·1 I.U. (as for other services).

§ Interpolated by means of Budget Statements and wage rates.

‖ Excluding housing, and assuming that 50 per cent of the food supply was consumed without passing through channels of retail trade in 1940, but only 40 per cent in 1953, and omitting services estimated at 1·2 and 2·1 billion I.U. in the respective years, we obtain figures for the amount of consumption through retail channels at 9·9 and 16·65 billion I.U. respectively, a rise of 68 per cent. Mr. Wiles's estimate (*Bulletin of the Oxford Institute of Statistics*, November-December 1954, p. 374) shows a rise of 79 per cent over this period.

efficiency or real product per man-hour, as we have seen in other countries, demands a different presentation. In some countries, considerable differences between real income and real product arise out of changes in the terms of trade, or positive or negative income from international investments. No appreciable issues arise here, as Soviet foreign trade has been on a very small scale throughout.

Mr. Boris Shimkin[1] gives an estimate of the number of males aged 15–59 occupied in agriculture, forestry and fishing in certain years. Some work will be done by males above and below these age ranges, but we can set against that the fact that forestry is included, and so we can expect about the right order of magnitude from the result. Here, as in all international comparisons, it is also expedient to exclude all females from the agricultural labour force.

For the years between 1928 and 1939 interpolation is made from known movements of the industrial and total population. Professor Baykov[2] gives a rural population of 115 millions in 1939, 126 millions in 1928 and 115 millions in 1913. Mr. Eason, in his paper to the 1954 World Population Conference, gives the following figures (in millions):

TABLE XXIV

	Rural Population	Agricultural Population	Males at Work in Agriculture
1926	125 *	114	35·3
1939	115	99	23·1 †
1940 (new territory) .	132	114	..
1953	120–135	104–116	34·5–39·3 ‡

* 1928.

† To these Mr. Eason proposes to add 8·5 millions of forced labour. The figure of 28·0 used in the following table is Mr. Shimkin's figure for 1940, adjusted for boundary changes.

‡ For 1950. Including forced labour. Mr. Shimkin supports the lower figure, which is adopted.

The ratio of occupied males to total population, on Shimkin's figures, is thus seen to be 28·2 per cent in 1939 and 27·1 per cent in 1928. This difference is understandable; there was probably a larger proportion of children in 1928, and this ratio is estimated to be applicable to 1913, giving 31·2 millions.

To analyse productivity further, we have to measure the size of the labour force, both urban and rural, and to ascertain average hours, at any rate for the urban population, and to distinguish agricultural from other products.

[1] *Fortune*, May 1951.

[2] *Journal of the Royal Statistical Society*, Part 4, 1943.

We can measure farm product in the first instance from the same data as in Table I, valuing each product, however, at farm rather than retail value.

The results are extremely disappointing. The economic advantages of tractorisation have been largely, if not wholly,

TABLE XXV

AGRICULTURAL PRODUCT, MILLION I.U.

	Farm Value I.U. per Metric Ton	1913	1928	1932	1934–37	1938	1951
Foods:							
Grain . .	28	1022	1041	924	1063	1197	1338
Potatoes . .	33	588	651	735	960	1000	1212
Meat and lard (including poultry) .	250	922	1119	310	765	834	784
Milk . .	40	928	1204	785	904	1040	1000
Fish . .	150	100	143	200	237	229	267
Sugar . .	58	78	71	48	115	146	186
Eggs . .	317	97	153	61	83	123	132
Other foods not included (fruit, vegetables, oils)	..	550	600	600	650	675	800
Cotton, flax and wool . .	..	240	260	280	380	500	650
Exports . .	..	515	..	..	..	..	..
TOTAL . .	..	5040	5242	3943	5157	5744	6369 *
Men occupied (millions) . .	..	31·2	34·1	35·5	31·2	28·0	34·5
Product per head I.U. . .	..	162	154	111	165	205	185

* Mr. Wiles (*Bulletin of the Oxford Institute of Statistics*, November-December 1954) links a recent statement by Khrushchev to Dr. Jasny's index to show 1952 production (on enlarged territory) to be 23½ per cent above that of 1928, as compared with the rise of 21½ per cent between 1928 and 1951 given in the above table.

offset by the loss of livestock and the inefficiency of forced labour, or of peasants who do not expect to be allowed to keep any substantial proportion of what they produce.

The results are even more disappointing when we take into account the fact that the 1913 and 1928 figures were considerably affected by "disguised unemployment". The extent of such "disguised unemployment" was

estimated at nearly 25 per cent of the rural population for 1913 [1] and 20–25 per cent for 1928.[2]

In the 1926 Census the number of females described as engaged in agriculture was about equal to the number of males. It seems clear that all women members of farm families were included. Excluding all females reported as engaged in agriculture, the labour force at the 1926 Census was 51·0 millions, and 66·4 millions in 1939. (Data from Eason, *Soviet Economic Growth*, p. 108.) For 1950, the lower of Mr. Eason's two estimates for labour force is 108·4 millions, or 80·4 millions if we deduct a number of female agriculturists assumed to be the same as in 1939 (plus a 15 per cent addition for change in territory).

For total national product per man-year and man-hour we have the following figures. The population-labour force ratio of 1950 is assumed to be applicable to all years since 1940, and is interpolated linearly between 1926 and 1939.

TABLE XXVI

	1913	1928	1932	1934–37	1937	1938	1940	1951	1953
Net national product, billion I.U.	22·3	25·5	22·3	30·25	33·95	34·9	41·0	54·1	61·8
Population, millions	138·3	152·4	158·0	161·5	166·0	169·0	193·0	203·0	207·0
Labour force (as defined above), millions	47·9	53·5	57·8	61·1	63·5	65·4	77·2	81·1	82·8
Real product per man-year, I.U.	465	477	386	495	535	535	531	669	747
Average hours per year, urban	2750	2200	2200	2200	2200	2200	2400	2400	2400
Average hours overall *	2782	2595	2542	2495	2473	2460	2568	2572	2572
Real product per man-hour, I.U.	·167	·184	·152	·199	·216	·217	·207	·206	·291

* Agricultural hours assumed 2800 throughout.

Overall per cent per annum rates of growth were:

1913–28	0·7
1928–38	1·6
1938–53	2·0

Though accelerating, the rate of growth is still below that of a good many other countries.

[1] Marcus, *International Labour Review*, vol. 33, p. 356.

[2] *International Labour Review*, vol. 27, p. 349.

From 1928, when a great deal of production was still carried out by handicraft, up till now, the capital-output ratio has risen from 0·5 to 2.

TABLE XXVII

	1928	1938	1951	1953
Total net product, billion I.U. .	25·5	34·9	54·1	61·8
Do. excluding agriculture . .	20·3	29·2	47·7	55·3
Capital, billion I.U. . . .	10·2	44·7	86·5	110·8

It may appear at first sight that this is still a low figure. By definition, however, it excludes agriculture, where fairly large increments of capital may be necessary to secure an increment of output, and also it includes

TABLE XXVIII

U.S. Capital-Output Ratio

Data in Billions of I.U. (i.e. 1929 dollars × 0·9)

	Reproducible Capital excluding Consumers' Durables, Agricultural Capital and Residences, International Assets and Obligations		Real Income (excluding Imputation)	Do. Non-agricultural	Ratio to Non-agricultural Income	
	Residences	Business and Government Capital			Residences	Business and Government Capital
1805	0·17	0·23	1·5	0·9	0·19	0·26
1850	1·9	3·66	7·6	5·2	0·37	0·70
1880	10·4	20·6	14·6	11·6	0·90	1.78
1890	23·4	39·3	21·6	18·2	1·28	2·16
1900	30·0	49·3	31·7	25·1	1.19	1·96
1912	43·8	79·3	48·0	38·0	1·15	2·09
1922	55·4	106·5	60·6	52·0	1·07	2·05
1929	83·2	138·8	86·6	78·7	1·06	1·76
1939	79·1	127·6	91·3	83·6	0·95	1·53
1948	82·6	168·2	147·9	136·1	0·61	1·24

only a minimum allowance for housing, which has been deliberately sacrificed to industry. The I.U. equivalent of newly constructed dwellings with bathrooms, etc., may be put at 50 per square metre of floor space; but for old

TABLE I

PRICE WEIGHTS PER METRIC TON

Commodity	F.A.O. (Gold Francs, 1934–38)	I.U. ($ of 1925–34)	O.U. (Rupees of 1948–49)
Grains			
Wheat	100	32·7	332
Rice, rough	70	. .	. .
Rice, milled	108	69·0	462
Rye	80	24·1	300
Barley	70	23·2	252
Oats	70	28·1	335
Maize	60		
Millet	70	19·0	235
Buckwheat	60		
Sorghum	60		
Wheat offals	. .	15·0	150
Starchy Roots			
Potatoes	50	33·1	300
Sweet potatoes	60		
Taro	60	40·5	450
Cassava, manioc, yuca	15		
Sugar *			
Refined	100	. .	. .
Raw	93	58·0	640
Pulses and Oil Crops			
Dry beans, peas	100	57·5	291
Castor beans	180	. .	. .
Cotton seed	60	. .	. .
Copra	140	§12	. .
Flax seed	140	78·11	. .
Groundnuts unshelled	120	86 ‡	430 ‡
Hempseed	100	. .	. .
Mustard-seed	130	88 ‡	547 ‡
Sesame	180	127 ‡	750 ‡
Soybeans	80	. .	. .
Olive oil	800	. .	. .
Palm kernels	110	. .	. .
Poppy seed	160	. .	. .
Rapeseed	140	88 ‡	547 ‡
Other oils and fats	. .	200	1000
Nuts			
Unshelled	200	300	. .
Fruits			
Total	120	. .	. .
Citrus	135	71·5	570

Commodity	F.A.O. (Gold Francs, 1934–38)	I.U. ($ of 1925–34)	O.U. (Rupees of 1948–49)
Fruits (*continued*)			
Deciduous	140	34	100
Grapes	60		
Bananas	60		
Dates	225		
Figs	75		
Berries	420		
Dried fruit	360		
Wine	150	..	..
Vegetables	90	18·4	46
Livestock Products			
Beef	400	..	..
Beef and veal	500	200	1550
Pork	700	304	2400
Mutton and lamb	600	271 ‖	2750 ‖
Buffalo meat	500	..	..
Goat meat	600	..	..
Horse meat	400	..	..
Poultry	750	506	1500
Game and rabbit	750		
Offal	400	100	..
Animal fats	400	..	..
Milk	100	39·5	850
Skim milk	40	..	..
Eggs	750	317	2700
Cheese	..	369	2600
Butter	..	800	5600
Fish	..	150	725
Fibres			
Abaca	250	..	..
Cotton	800	290	2975
Flax fibre	900	182	..
Hemp fibre	700	161	..
Henequen	225	..	..
Jute	200	132·5	580
Sisal	225	..	..
Wool, greasy basis	1400	566	2125
Silk, raw	7500	576 ¶	19000
Other Crops			
Cacao	300	211 †	..
Coffee	500	547	5500
Tea	1500	500	4690
Tobacco	1400	349	1730
Rubber	900	900	9000

* I.e. value on farm of cane or beet, per ton of sugar content.
† Cocoa beans. ‡ Value of oil content only.
§ Value of oil content 51·6. ‖ Includes goat meat. ¶ Cocoons.

taken of the amount of grain and other foodstuffs used as fodder for animals, or as seed.

There now arises the problem of weighting. In the tables which follow the I.U. is used in the economically developed countries and the O.U. for the poorer countries. In compiling their own index numbers, F.A.O. use a system of weights based on export prices in the world market in the period 1934–38. Where a world market figure did not exist, exchange ratios against wheat were worked out in the most important local market for which data could be obtained. The comparison between the three sets of weights is shown in Table I.

Professor Moore (in *Economic Demography of Eastern and Southern Europe*) has undertaken an analysis of agricultural productivity in which, in effect, he weights the different products by European rather than American prices, thus giving a higher relative weight to grain and a lower to livestock products. He uses farm accountancy statistics to determine net from gross values of production, i.e. makes deductions not only for seed and fodder, but also for fertilisers, equipment and all other expenses of production involving the purchase of goods or services, leaving the true net income of those engaged in agriculture.

The following shows the composition of Professor Moore's "Crop Unit" and its re-expression in I.U.:

TABLE II

	Composition of Crop Unit in Quintals	I.U. per Quintal	Value in I.U.
Wheat	0·16	3·27	0·52
Rye	0·09	2·41	0·22
Barley	0·06	2·32	0·14
Oats	0·10	2·81	0·28
Maize	0·06	1·90	0·11
Potatoes	0·53	3·31	1·75
	..	..	3·02

Professor Moore's data are re-expressed as I.U. by this factor. He gives further data showing (in the same units)

real net income from forestry and fishing, which in some

Malaya	.	.		..	..	..
Manchuria	.	.		..	..	..
Mexico	..	..		..	..	..
Netherlands	222·1	11·1	48	..	..	..
New Zealand	..	..	40	..	..	..
Norway	58·6	29·8	29	..	..	..
Pakistan	.	..	[g]	14,073	12,000	12,900
Peru	.	.	17	..	..	..
Philippines	..	.	46	..	3,070	3,600
Poland	781·5	97·6	.	..	..	..
Portugal	182·8	41·1		..	..	..
Roumania	641·5	65·8		..	..	..
Scotland	81·2	10·3	.	..	..	..
Spain	1082·8	31·2		..	..	..
Sweden	205·0	71·5	34	..	..	..
Switzerland	127·1	9·8	16	..	..	..
Thailand	..	..		..	2,300	3,410
Tunisia	..	..	.	..	..	..
Turkey	487·1	9·8	51	4,916	..	..
Union of S. Africa	..	..	30	3,439	..	..
United Kingdom	..	..	99	..	..	..
United States	..	..	859	..	..	..
Uruguay	..	..	15	..	..	..
U.S.S.R.	5473·4	353·3	.	..	..	..
Yugoslavia	477·7	66·5	.	..	..	..

[a] Belgium-Luxembourg.
[f] India and Pakistan.
[j] Western Germany.
[b] Inc
[e] 1936–37 — 1938–39.
[g] Inc fish as figures not available.
[k] F.A ly.

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real net income from forestry and fishing, which in some countries are carried on as subsidiary occupations by agriculturists, and may be a substantial source of income.

These results refer to about the year 1930. They are included in Table III for comparison. Estimates, in internationally comparable units, of the value of agricultural production in different countries were also published in the *Bulletin de la Statistique Generale de la France* in 1948, referring to the period 1936–38, and by Dr. Ohkawa [1] (he does not make it clear to which period he refers). Unfortunately, in neither case are the sources of the information clear, and they probably overlap with other available sources. The results are therefore omitted from the table.

F.A.O. measure, in effect, in metric tons of wheat or its exchange equivalent. Multiplying by a factor of 32·7 we should therefore be able to convert their results into I.U. As indicated above, however, the different weighting leads to considerably different results. The two columns in Table I headed "Ratios" are obtained, for two separate periods, by taking as numerator the aggregate value obtained by applying I.U. values to each element of output, and as denominator the F.A.O. result multiplied by the factor of 32·7. To convert to I.U. the F.A.O. values of 1948–49 to 1951–52, the mean of these two ratios is used.

F.A.O. do not include fishing; and in their deduction for fodders they do not take any account of oilcakes, whether home-produced or imported. Their results are therefore adjusted accordingly. The fishing which is included throughout Table III does not, however, comprehend whaling.

Some further very interesting results for a number of Oriental countries, pre-war and post-war, have been kindly made available by Dr. de Vries of the International Bank, Washington (privately communicated). He has measured in terms of metric tons of cleaned rice, using for this purpose the exchange ratios prevailing between rice and other commodities within the markets of the country concerned.

[1] *Bulletin* No. 1 of the National Research Institute of the Japanese Ministry of Agriculture and Forestry, 1949.

He is thus, in effect, using an O.U. concept as described above. His results are multiplied by a coefficient of 462 to express them in O.U. as we have them defined here.

There is, as has already been made clear, no single coefficient for relating O.U. to I.U.—if there were, a separate unit would not be necessary—but we may use a factor of approximately 10 when we are dealing with the staple crops, much more when we are dealing with milk, much less when we are dealing with fruit and vegetables.

The above figures represent the product of agriculture and fishing only. It is convenient also to include forestry

TABLE IV

PERCENTAGE ADDITIONS TO I.U. VALUE OF AGRICULTURAL AND FISHING OUTPUT REQUIRED TO ACCOUNT FOR FORESTRY

	1937	1949–52		1937	1949–52
Algeria	0·2	0·6	Madagascar	..	7·1
Australia	1·0	3·0	Netherlands	0·4	0·2
Austria	10·1	10·3	New Zealand	1·2	1·6
Belgium	1·5	1·1	Norway	4·8	4·1
Brazil	9·8	..	Philippines	1·9	2·2
Canada	15·1	13·2	Portugal	..	3·2
Chile	9·7	7·1	Spain	..	1·8
Denmark	1·1	0·7	Sweden	26·8	19·6
Finland	61·1	33·5	Switzerland	3·9	4·0
France	2·4	2·8	Thailand	..	1·4
W. Germany	3·4*	3·4	Turkey	2·2	2·0
Greece	4·1	3·0	Union of S. Africa	1·0	1·4
India	0·4†	1·1	United Kingdom	0·3	0·6
Italy	2·1	2·1	United States	7·8	5·0
Japan	7·6	5·7			

* All Germany. † Including Pakistan.

at this stage, as the employment figures with which we have to compare them include agriculture, fishing and forestry grouped together. The addition will be trivial for most countries, but substantial for a few. The data are those of F.A.O. (as published in *U.N. Statistical Year Book*) in cubic metres of roundwood without bark, whether used for fuel, pulp or timber. In U.S.A. in 1925–34 the average value, f.o.b. mill, of 1000 board feet of timber

was $23 (*Historical Statistics of United States*), and about 11·1 cubic metres roundwood appear to constitute 1000 board feet. A cubic metre is therefore valued at 2·07 I.U.

For a number of countries we can measure the trend, over a long period of years, of real farm product per man-year, or per man-hour.

The employment data are obtained from the population Census, and exclude women (for reasons given in Chapter IX), and include fishing and forestry unless otherwise specified.

Australia

Official index numbers of rural output, and of rural employment, are available for extrapolation. The Census data indicate the following numbers employed, in thousands :

1911	479
1921	527
1933	537
1939	564
1947	534

Extrapolating, we construct the following table :

TABLE V

	Output, including Forestry, million I.U.	Numbers Occupied, thousands	Output per Head, I.U.
1890 *	138	150	920
1911	646	479	1350
1921–22	745	527	1411
1923–26	..	..	1495 †
1926–29	..	..	1650 †
1930–35	985	535	1840
1934–38	1003	556	1802
1940–45	1010	517	1950
1945–48	1000	531	1882
1948–49	1141	527	2065
1949–50	1217	531	2288
1950–51	1151	531	2170
1951–52	1098	527	2081

* New South Wales only. Coghlan, *Wealth and Progress of New South Wales*, gives a figure of £20·45 millions value of output.

† Extrapolated from data calculated by Professor Wadham.

The long-period upward trend, since 1911, has only been 1·2 per cent per annum, and deviations from this trend have so far only been temporary. The recent trend is, however, discouraging.

Austria

In addition to the I.U. data we have some earlier figures of value of output in national currency, which can be converted to I.U.'s.

TABLE VI

	Output in National Currency	Output, million I.U.	Males Occupied, millions	Output per Man
1951	..	227	0·52	437
1934	..	269	0·70	387
1913	4186 m. kr. (Waizner, *Metron*, 1927–28)	1000	4·37	229
1901–3	2120 m. kr. (Hertz, *Economic Problem of the Danubian States*)	619	4·12	150
1859	2073 m. fl. (Neumann-Spallart, *Uebersichten der Weltwirtschaft*, for Austria-Hungary)	1075	8·50	127

Belgium

The Banque Nationale de Belgique (*Bulletin*, August 1954) estimates the following index numbers of real product per man-year in Belgian agriculture :

1910	100
1929	134
1936–38	179
1949	227
1950	242
1951	252
1952	250
1953	259

indicating a fairly steady rate of growth of about 2·2 per cent per year. If the figures were converted from man-years to man-hours, the trend would be a little higher.

Also, the output figures have *not* been subjected to a deduction for imported fodder grains. These were rising in relative importance up to 1938, and have been falling

in relative importance since. True net output per man therefore must have risen *faster* than those figures show since 1938, more slowly before.

Czechoslovakia

It was estimated by Professor Brdlik (quoted by Professor Hertz, *Economic Problem of the Danubian States*) that real net income from agriculture and forestry (the latter contributing 10 per cent of the whole) was 12 per cent lower in 1929 than in 1909–13 — the decline occurring mostly in the Eastern provinces. This indicates an almost stationary output per man engaged over this period. It does not seem possible to obtain any accurate subsequent figures of trend.

Hodza (*Proceedings of the International Conference of Agricultural Economists, 1934*) gives 1926–29 output as kr. billions (£231 millions).

Denmark

Døssing (*Tidskrift for Landøkonomi*, 1950, p. 509) estimates that real product per man-year rose steadily at the rate of 2 per cent per annum over the whole period 1880–1950. Most recent figures show :

TABLE VII

	Output, including Forestry, million I.U.	Males Occupied, thousands	Output per Man
1952	503	382	1319
1934–38	403	440	915

indicating a rate of increase of 2·3 per cent.

Thompson (*Journal of the Royal Statistical Society*, 1926, p. 217) revalued Danish output (excluding fruit and vegetables) of 1922 at British prices, and found it to be £9·87 per acre, after deducting feeding-stuffs, but before deducting fertiliser. (Thompson's corresponding figure for Great Britain was £6·31, which we can equate to £5·63 at 1924–29 prices, or £173 millions in all. Dr. Ojala, in

Agriculture and Economic Progress, obtains for 1925–29, excluding fruit and vegetables, an output of £188 millions for United Kingdom, or £176 millions for Great Britain — so Thompson's figures are satisfactorily checked.) He found Danish product per acre 56 per cent higher than British, per man 19 per cent higher, indicating an output per man of about 715 I.U. in 1922 (deduced from the figure for Great Britain). This indicates a rate of growth of 1·8 per cent per year between 1922 and 1934–38.

Egypt

Production per acre appears to have been rising, over a considerable period, at about the same rate as agricultural employment (*Milbank Memorial Fund Quarterly*, January 1949). Product per man appears therefore to have been approximately constant.

France

TABLE VIII

	Output, including Forestry, million I.U.*	Output, based on De Foville's Estimates †	Males Occupied, millions	Real Product per Man, I.U.
1950–52	2050	..	3·53	581
1934–38	1887	1887	4·28	441
1930–34	1887	..	4·46	422
1925–29	1815	..	4·74	383
1920–24	1670	..	5·00	334
1910–13	1815	..	5·34	340
1895–99	1650	..	5·56	297
1882	..	1712	5·9	290
1868–72	1725	..	6·3	274
1860–64	1450	..	6·7	217
1852	..	1218	7·1	172
1830–34	910	..	7·8	117
1815–18	545	..	7·0	78
1750–90	545	..	7·0	78

* Prior to 1934, trend estimated by Professor Fourastié in *La Civilisation de 1960*, using after 1920 the data of MM. Brousse and Pellier.

† In *La France économique* De Foville estimated output in 1852 and 1882 at 8·06 and 13·46 billion francs respectively, excluding seed and fodder, including produce consumed by cultivators and their families. These figures were converted to 1938 prices and compared with M. Klatzmann's estimate of 69 billions output in that year.

It appears that here we are dealing with three clearly differentiated phases :

TABLE IX

	Rate of Growth, per cent per year
1815–1870	2·4
1870–1920	0·4
1920–1952	1·9

M. Coutin (in *Population*, January-April 1949) estimated that 28·5 billion man-hours were worked in French agriculture in 1896, 26·7 in 1906, 18·0 in 1921 and 17·5 in 1946. These figures assume that, in the earlier years, men and women members of farm families worked 3000 and 1500 hours respectively, wage workers 2500. A fall in customary hours may partly explain the slow rate of growth 1870–1920.

Germany

TABLE X

(Current Boundaries in each year : West Germany, 1950)

	Output, including Forestry, million I.U.*	Males Occupied, million	Real Product per Man
1951	1880	2·39	820
1934–38	3157	4·38	720
1930–34	2845	4·7	606
1924–30	2580	4·7	548
1909–13	2790	5·0	558
1895	2035	4·15	490
1882	1630	3·45	473

* Extrapolated back from 1934–38 on data given in Institut für Konjunkturforschung, *Weekly Bulletins*, 20th October 1937 and 12th August 1936.

The long-period upward trend appears to be only about 0·9 per cent per annum, and that was so seriously interrupted by the inflation period of the 1920s that the trend line was not regained until the late 1930s. We cannot gauge the recent trend, because product per man in W. Germany was probably always higher than in E. Germany.

Greece

The following figures have been estimated by M. Coutsomaris (*Journal of Farm Economics*, May 1954) for gross product per *man-day*, in index numbers :

1911	113
1917–18	92·5
1920–24	98·4
1925–29	107·2
1930–24	117·2
1935–58	136·0

The most recent figures would probably again show a fall.

Ireland

For Ireland, annual statistics are available of the number of males engaged in agriculture, and besides the F.A.O. indexes there is an official index of the volume of

TABLE XI

	Source	Net Output after deducting Fodder and Seed		Numbers Engaged (Males), thousands	I.U. per Head
		At 1913 Prices, £ million	Million I.U.		
1951–52	..	..	210·4	447	471
1950–51	..	..	217·4	461	471
1949–50	..	..	215·5	476	452
1948–49	..	..	206·0	490	420
1934–38	..	..	222·4	560	397
1929–30	Professor Duncan	..	230	564	406
1926	Professor Duncan	..	218	595	366
All Ireland					
1908	Board of Trade Census	40·5	177	810	218
1880	Giffen, *Economic Inquiries and Studies*	40·0	175	1000	175
1868	Caird, *Journal of the Royal Statistical Society*, 1868, p. 139	47·2	207	1095	189
1837	MacCulloch	28·7	126	1800	70

production, on a 1929–30 base, since 1936–37. This is carried back to 1926 by Professor Duncan's figure of net income produced by agriculture, allowing for a slight change in prices. This is compared with earlier data, re-expressed at 1913 prices, given in *National Income and Outlay*. The early data purport to measure net, not gross product.[1] For 1908 and earlier years data refer to the whole of Ireland and employment data are from the Census. The figures in 1913 £ are converted to I.U. by the coefficient established for Great Britain.

These results show, since the 1860s, a rather irregular upward trend of 1·3 per cent per annum. It is possible that the rate before then was higher, but MacCulloch's datum is very uncertain.

Italy

Estimates of Italian agricultural output of 4·5 billion lire in 1903 and 7·0 billion in 1913 were made respectively by Bolton King (*J.R.S.S.*, 1903) and Attolico and Giannini (*J.R.S.S.*, 1918). On its exchange rate and the purchasing

TABLE XII

	Produce, million I.U., including Forestry	Males Engaged, millions	Product per Head
1903	705	6·30	111
1913	890	6·03	148
1934–38	1328	6·40	208
1951	1443	6·36	227

power of sterling in 1913, the lire of that year should have had a purchasing power of 0·227 I.U., but a weighted average of Italian price quotations for agricultural products indicates a purchasing power of only 0·127 I.U. Italian agriculture at that date was highly protected and sold its

[1] Dr. Drescher's index (*Weltwirtschaftliches Archiv*, March 1935), which is based on gross output, shows a rise of 25 per cent between 1868 and 1908. The difference from the trend given in Table XI is presumably due to the increasing amount of fodder for livestock incorporated in gross output.

produce at well above world prices. It is assumed that a similar degree of protection prevailed in 1903.

These data seem to indicate a decelerating rate of improvement: but the earlier ones are very uncertain.

Japan

For Japan, data back to the 1890s were compiled by Dr. Penrose.[1] His figures go up to 1925–27, and may be compared with the F.A.O. data for 1934–38, and figures from current official statistics for 1951.

TABLE XIII

JAPANESE FARM AND FISHERY PRODUCT IN MILLIONS OF O.U.

	1894–96	1912–14	1918–20	1921–25	1925–27	1934–38	1951
Fish	401	940	957	1122	1198	2480	2826
Rice	2025	2702	3075	2965	3050	3500	3430
Barley	495	593	547	531	518	309	388
Wheat	205	270	336	302	324	386	392
Other grain	185	171	173	151	130	115	104
Potatoes	52	229	411	280	298	382	767
Sweet potatoes	869	1356	1560	1358	1240	1135	1995
Beans	138	160	183	176	160	244	198
Tea	146	154	181	168	174	230	(150)
Meat	(51)	164	212	249	256	420	366
Eggs	(28)	76	110	141	170	(200)	(170)
Fruit	(120)	260	269	307	369	334	507
Milk	(30)	44	54	68	78	267	340
Vegetables	(136)	221	238	246	256	250	366
Silk	118	269	410	422	456	200	252
Tobacco	(52)	87	87	111	112	111	163
Sugar	(28)	45	53	44	45	26	15
TOTAL	5080	7741	8858	8642	8834	10,587	12,435
Per head of population, O.U.	122	145	159	148	146	155	148
Per male engaged, O.U.	503	833	1028	1020	1050	1390	1413

Up to 1938, this latter line indicates an upward trend of 2·3 per cent per annum, which has been seriously disrupted by the war, but which may be resumed.

[1] Published at the Tokyo Session of the International Statistical Institute in 1930, and also in a book.

New Zealand

The official index of rural production can be used to extrapolate from 1935–39.

TABLE XIV

	Output, including Forestry, million I.U.	Number of Men, thousands	Product per Man, I.U.
1950	471	110	4290
1946–49	456	125	3650
1943–46	435	130	3345
1940–43	449	145	3100
1935–39	408	147	2770
1931–34	374	134	2792
1928–31	330	120	2748

These figures appear to indicate an accelerating rate of growth in a figure which is already much the highest in the world.

Spain

TABLE XV

	Real Product, including Forestry, million I.U.	Males Occupied, millions	Product per Head
1951	1008	(3·5)	288
1943–47	890	(4·25)	209
1931–35	1175	3·54	332
1928–32	1090	3·73	292
1918–22	1020	4·35	234
1906–10	853	4·95	172

For the earlier years the official index is used. The base is obtained from an adjustment of Professor Moore's figure for 1931–35.

TABLE XVI

	Income from Agriculture and Horticulture less Seed and Fodder, million kr.*	Income from Agriculture and Horticulture less Seed and Fodder, converted to I.U. millions †	Deductions for Materials Purchased from Industry, Transport and Depreciation ‡		Males Occupied in Agriculture,‖ thousands	I.U. per Male Occupied		Average Hours	Product per Man-Hour
			Million kr.	Million I.U.§		Product	Deductions		
1861–65	204	89·8	12	4	645	139	6	3520	0·039
1866–70	249	101·7	15	5	656	155	8	3510	0·044
1871–75	315	120·8	21	7	670	180	10	3470	0·052
1876–80	334	123·8	24	9	686	180	13	3460	0·052
1881–85	318	123·8	30	12	688	180	17	3450	0·052
1886–90	296	132·9	27	11	677	196	16	3500	0·056
1891–95	356	147·9	37	16	664	223	24	3420	0·065
1896–1900	410	163·5	50	21	650	252	32	3350	0·075
1901–05	457	160·0	70	28	656	244	43	3250	0·075
1906–10	628	186·7	96	35	679	275	52	3175	0·087
1911–15	771	193·7	128	39	697	277	56	3100	0·089
1916–20	1733	170·8	325	37	709	240	52	3000	0·080
1921–25	1120	190·7	312	62	711	268	87	2900	0·092
1926–30	1073	222·6	297	73	704	316	104	2900	0·109
1934–38	..	323·5	..	..	681	475	..	2600	0·182
1950–51	..	368·3	..	..	565	654	..	2500	0·262

* From *National Income of Sweden*, Part I, Table 2 (agriculture) and Table I (horticulture).

† Converted to 1861–65 prices by data given by Dr. Ojala, *Agriculture and Economic Progress*, p. 148. The individual items of 1861–65 output, less seed and fodder, revalued directly to I.U., give a total of 89·8 millions (of which 31·8 was milk, 20·4 potatoes, and 8·4 rye).

‡ From *National Income of Sweden*, vol. 2, pp. 140-41. A small entry for banking and insurance costs is also included (see Ojala, p. 44). These entries include some costs incurred by forestry and fishing. On the other hand some industrial materials used by agriculture are in the column "Imported Raw Materials", which is not included here. The two errors should be of similar order of magnitude and should compensate each other However, "industrial materials" still includes such goods as bran and molasses, and the final result, for comparison with other countries, is therefore high.

§ Amark's index (from official year book) linked to I.U. in 1929.

‖ Number of males actually occupied in agriculture, forestry and fishing is known for each Census back to 1900 (the proportion in forestry and fishing is assumed to be the same in earlier years as in 1930): before 1900 has to be extrapolated back on the basis of total population dependent on agriculture.

¶ For earlier periods, taken as industrial hours + 200.

N.B.—Forestry excluded from both output and employment.

United Kingdom

TABLE XVII

	Gross Output,* £ million	Gross Output: Less Imported Seed, Fodder and Livestock,† £ million	Gross Output: At 1911–13 Prices,‡ £ million	Gross Output: Excluding all Ireland before 1922,§ £ million	Million I.U.‖	Gross Output Including Fishing, million I.U.	Numbers of Males Engaged in Agriculture and Fishing,¶ thousands	Of whom Fishing	Real Product per Head (I.U.): Agriculture and Fishing	Real Product per Head (I.U.): Agriculture only	Materials and Services Used in Agricultural Production Purchased from Non-Farm Sector, per Male Engaged in Agriculture,** I.U.	Average Hours in Agriculture	Product per Man-Hour
1867–69	229·8	201·7	174·0	131·8	689	774	1556	39	496	455	139	3200	0·142
1870–76	247·2	211·2	176·0	133·9	700	785	1490	43	526	485	151	3170	0·153
1877–85	219·2	180·8	165·2	127·2	666	751	1408	61	534	495	167	3120	0·159
1886–93	187·8	155·4	172·7	133·4	698	785	1358	55	578	535	172	3080	0·174
1894–1903	182·8	146·4	169·8	129·1	675	788	1291	55	610	546	194	3020	0·181
1904–10	200·8	161·6	176·0	134·2	702	866	1327	65	652	556	196	2970	0·188
1911–13	222·1	177·2	177·2	132·8	694	873	1354	70	644	540	198	2950	0·183
1920–22	490·0	409·2	176·5	133·5	698	842	1261	65	667	584	272	2720	0·215
1924–29	279·7	208·8	134·3	..	704	861	1333 ††	64	645	555	259	2720	0·204
1930–34	236·5	183·7	145·2	..	760	914	1295	64	705	617	274	2700	0·228
1935–39	2·790	213·8	158·5	..	879	992	1210	64	820	724	390	2660	0·272
1949–52	..	..	..	..	1105	1257	1084	35	1158	1053	761	2500	0·421

[*Notes to Table overleaf*

NOTES FOR TABLE XVII

* Ojala, *Agriculture and Economic Progress*, p. 61. Excluding all crops used for fodder or seed.

† Data from Ojala, p. 213. Deducting only the farm or port value of fodder, seeds and livestock purchases — in the latter two cases this value is taken at 75 per cent of the total.

‡ From ratios given by Ojala, pp. 208-9.

§ From ratios given in *National Income and Outlay*. p. 246. Northern Ireland remains in the figures from 1924 onwards.

‖ Linked on 1935–39 to data given in previous table (992 million I.U., of which 163 millions represent fish).

¶ Since 1924, including an estimate of 120,000 for Northern Ireland. 1951 data from Census sample. Data back to 1881 from *Statistical Abstract*, 81st issue, p. 128. Data before 1911 reduced by 8·4 per cent (on information given there) to allow for difference of definition. Data for 1861 and 1871 from Fussell, *Economic Journal*, 1924. Very similar figures for 1861, 1881 and 1901 are given by Lord Eversley, *J.R.S.S.*, 1907, p. 267. Linear interpolation between Census dates.

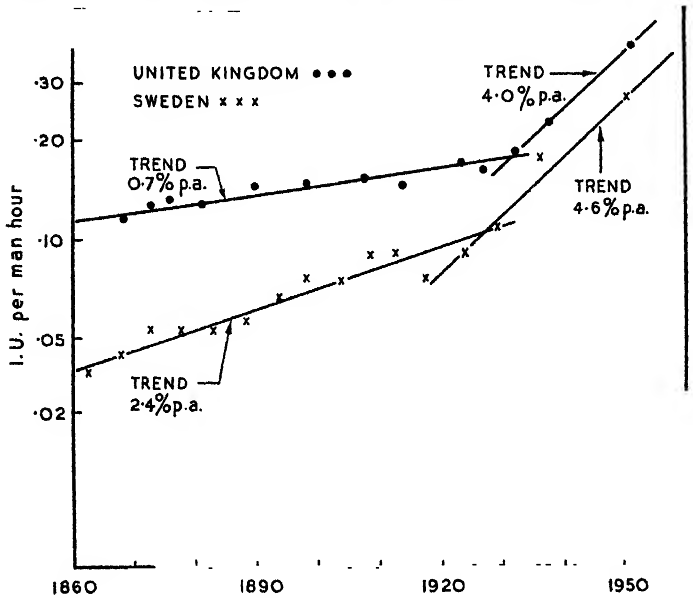
** Ojala's figures (p. 213) includingi distributive margins on fodder, seed and livestock purchased (whether home-grown or imported), but excluding rates and land tax. His figures for 1935–39 fall £15 millions short of Raeburn's and this discrepancy is distributed over the preceding periods to disappear for 1911–13 and earlier. Converted into I.U. by a general price index, and then an unchanging addition of 60 million I.U. made for maintenance of buildings. For the two most recent years, the following comparisons are given in, or can be estmated from, Raeburn's figures, all expressed in £ million of 1951–52 purchasing power :

	Pre-war	1951–52	1952–53
Machinery	34	122	140
Margins on fodder	42	34	35
Margins on seeds and livestock	14	15	15
Fertiliser	20	60	70
Other	49	72	84
	159	303	344
Equivalent in million I.U.	387	738	839
Add for repair of buildings	447	798	899

The figure given in the column is computed for 1951–52 ; for 1952–53 it rises to no less than 874. For 1952–53 gross product per man was probably about 1100 I.U.

†† Note *inclusion* of N. Ireland.

TREND OF REAL PRODUCT PER MAN-HOUR U.K. AND SWEDEN



U.S.A.

From 1870 to 1940 the upward trend in productivity per man-hour was remarkably steady at 1·6 per annum — a figure very satisfactory by European standards, but below the rate of upward trend for the American economy as a whole. The war years, years not only of increased demand and high prices but also of special facilities for obtaining new equipment, gave an upward trend which astonished all critics. It was contended that this largely represented the introduction of equipment and methods which had been known in the 1930s but which the farmers could not then afford to install. By 1949–50 there were distinct signs of a slower rate of growth. But then, touched off perhaps by the increasing labour shortage which came with the Korean war, the rapid upward trend was resumed. From 1940 to 1953 the over-all upward trend in real product

TABLE XVIII

	Farm Output, billion I.U.*	Farm Labour Force,† million	Produce per Head, I.U.	Average Hours per Year ‡	Product per Hour
1869–71	2·50	6·48	386	3250	·119
1879–81	3·81	8·10	470	3140	·150
1889–91	4·75	9 36	507	3030	·167
1899–1901	6·07	10·26	593	2920	·203
1909	6·46	11·0	588	2811	·209
1910	6·74	10·9	619	2805	·220
1911	6·74	10·8	625	2800	·223
1912	7·42	10·8	687	2795	·246
1913	6·65	10 8	616	2789	·221
1914	7·34	10 8	680	2784	·244
1915	7·51	10·8	695	2778	·250
1916	6·82	10·8	631	2773	·228
1917	7·33	10·6	692	2767	·250
1918	7·33	10·2	719	2762	·260
1919	7·25	10 0	725	2757	·263
1920	7·85	10 2	770	2751	·280
1921	6·91	10·3	671	2746	·244
1922	7·59	10·3	736	2740	·268
1923	7·67	10 2	752	2735	·275
1924	7·67	10·2	752	2729	·275
1925	7·93	10·3	769	2724	·282
1926	8·10	10·4	779	2719	·286
1927	8·10	10·1	802	2713	·295
1928	8·45	10·2	828	2708	·305
1929	8·26	10·4	794	2702	·294
1930	8·10	10·3	786	2697	·291
1931	8·86	10 3	859	2692	·319
1932	8·61	10·2	844	2686	·314
1933	7·93	10·1	785	2680	293
1934	6·74	9·9	680	2675	·254
1935	8·18	10·11	809	2670	·303
1936	7·25	10·0	725	2665	·272
1937	9·21	9·82	938	2660	352
1938	8·95	9·69	924	2655	·347
1939	9·03	9·61	940	2650	·354
1940	9·37	9 54	983	2650	·370
1941	9·73	9 10	1069	2700	·396
1942	10·91	9·25	1178	2800	·421
1943	10·66	9·08	1174	3000	·391
1944	11·09	8·95	1239	2800	·443
1945	11·00	8 58	1283	2600	·493
1946	11·33	8 32	1361	2400	·567
1947	10·91	8·27	1320	2350	·562
1948	11·77	7·97	1479	2350	·629
1949	11·68	8·03	1457	2350	620
1950	11·60	7·51	1543	2350	·657
1951	11·84	7·05	1680	2350	·715
1952	12·28	6·80	1781	2350	·758
1953	12·28	6·54	1879	2350	·799

* Based on 8·52 billion I.U. (U.S. output as given in previous table, excluding fish) for 1935–39. Official index of farm output, which excludes fodder and farm-work animals, since 1910. Earlier years from Messrs. Strauss and Bean, *U.S. Department of Agriculture Technical Bulletin* No. 703 (1940), p. 126, linked on period 1910–14 (ideal index). Most recent data adjusted on U.S.D.A. *Farm Cost Situation*, March and September 1953.

† Farm Labour Force, in employment, as estimated by Census Bureau. Since 1935, as published in "Annual Report on Labour Force" or "Survey of Current Business". 1929–34, from *Monthly Labour Review*, December 1947. 1909–28, "Farm Employment", as published by U.S. Department of Agriculture in *Annual Statistics*, 1952, p. 637, reduced by 10 per cent to place on a comparable basis with Census Bureau estimates.

Messrs. Barton and Cooper in *Progress of Farm Mechanisation* (*U.S.D.A. Misc. Publication* No. 630) estimate farm employment at each Census date 1820–1900 inclusive on a basis comparable with the above. Their figures, also reduced by 10 per cent, are used since 1870. For the earlier years, *before* making the 10 per cent reduction, their figures show:

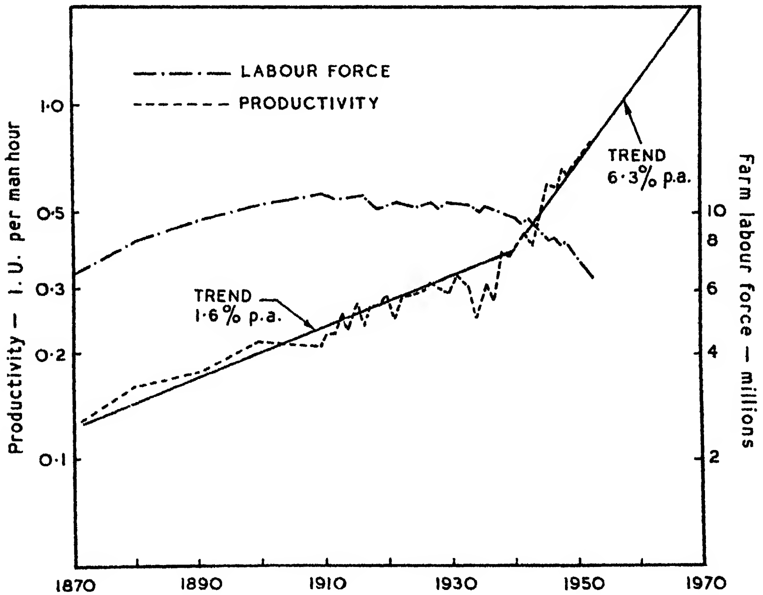
	Millions		Millions
1820	2·2	1850	5·1
1830	2·9	1860	6·6
1840	3·9		

‡ Partly assumed. Messrs. Barger and Landsberg (in *American Agriculture*) give 2800 for 1909–13 and 2675 for 1932–36. Assumed figure of 3250 for 1870. Value for 1948 from *Farm Economics*, February 1944.

per man-hour has been no less than 6·3 per cent per annum, and it shows small sign of deceleration.

The labour force, on the other hand, shows every symptom of accelerated decline. The well-known " Paley Report " (the President's Material Policy Report of June 1952) estimated that the rural labour force of 1975 would be 10 per cent below the 1950 level. It has fallen a good deal more than that already. A more realistic estimate

U.S. FARM LABOUR FORCE AND PRODUCTIVITY



for the United States is that, by 1975, the rural labour force will be down to about 2 millions and we may also well assume that they will work a 40-hour week or 2000 hours a year. Even with the upward trend in real product per man-hour continuing at the full present rate, this indicates an aggregate product by 1975 of 11·2 billion I.U., or below the present level. With a rapidly rising population, and with demand per head still rising, the United

States will find her farm surpluses, though embarrassing temporarily, no permanent problem. The United States already imports very large quantities of farm products, particularly sugar, coffee and wool, but will be a greatly increased importer in the next two decades.

Dr. Tintner (*Econometrica*, April 1944), using data given by Messrs. Barger and Landsberg in their book *American Agriculture*, brought up to date by U.S. Department of Agriculture Statistics, found the following equation for the period 1920–41 :

Define

Log of production as . .	x_1
Log of employment as . .	x_2
Log of capital as . . .	x_3
Time in years . . .	x_4 (end 1930 = 0)

Then

$$x_1 = 2{\cdot}7735x_2 + 0{\cdot}9020x_3 + 0{\cdot}0087x_4 - 0{\cdot}2644,$$

i.e., with a fixed capital and labour force, output tends to rise 2·0 per cent per year owing to technical changes alone (antilog 0·0087 = 1·020).

An unexpected deduction from this equation, however, is that a loss of 1 per cent in the labour force (x_2 has been falling throughout the period) causes a fall of 2·8 per cent in output.

This certainly conflicts with the concept of a diminishing returns agriculture, so far as short-run changes are concerned. This may be because American agriculture is already seriously undermanned in relation to its other resources. Dr. Tintner in correspondence has also agreed that some of the observed effect may be due to the loss of labour being selective, occurring more rapidly in the case of the more efficient men and in the higher-productivity areas.

But, in any case, these results conflict violently with those computed by Dr. Tintner and Mr. Brownlee from the relationships between a number of Middle Western farms in a single year (*Journal of Farm Economics*, 1944).

In this case, the factor elasticities of output were found to be:

Land . . .	0·34
Labour . .	0·24
Capital . .	0·41

These coefficients bear some relation to the coefficients found in Britain, from a time-series, by Mr. Lomax (*The Manchester School*, May 1949). For labour the coefficient was 0·18, for capital 0·37, with an upward time trend of 3 per cent per annum.

It is clear that the subject of production functions in agriculture urgently needs further examination.

Other Countries

New Zealand has by far the most productive rural economy in the world. When these comparisons were first made, in respect of the period about 1934–35, New Zealand had a substantial lead over the rest of the world; she has now greatly increased it. Second, but a long way second, comes Australia, and then Iceland, with a product almost entirely of fish. U.S.A. and Canada are considerably below these, and only slightly above the most productive European economy, Denmark. Norway is also largely a fishing economy. Then come Britain and the Netherlands, followed by Argentine and Belgium.

In the countries where the product is measured in O.U. (which unit, in respect of many of the staple crops, represents about one-tenth of an I.U.), the range is also wide, from Brazil, which is comparable with some of the lower figures in the left-hand table, down to India, which has not much more than a quarter of Brazil's meagre output per head.

Lower still, it is generally supposed, are the figures for China. But here great regional differences are found to prevail. Professor J. L. Buck, in his book *Land Utilization in China*, works out the average product for each region in kilogrammes of grain equivalent per man equivalent. Man equivalents take account of the labour of women

and boys, while grain equivalents are obtained by converting all other products to grain on the basis of the prices prevailing in the local markets — in effect, a procedure similar to that of Dr. de Vries. For each region, however,

TABLE XIX

		Output, including Forestry, million I.U.	Males Occupied, millions	Output per Man
Algeria	1948	193	1·81	107
Argentine	1947	1600	1·63	985
Belgium	1950	323	0·35	925
	1934–38	254	0·46	552
Brazil	1950	2640	9·17	288
	1935–39	2450	8·79	278
Canada	1951	1565	0·98	1595
	1934–38	1101	1·30	848*
Ceylon	1950	222	1·08	206
Chile	1935–39	132	0·55	240
Colombia	1935–39	385	1·82	211
Cuba	1950	486	0·88	552
	1935–39	310	0·70	441
Finland	1950	261	0·55	475
	1934–38	236	0·70	337
Malaya	1949	260	0·89	292
Netherlands	1950	596	0·602	992
	1934–38	491	0·569	865
Norway	1951	421	0·335	1260
	1934–38	304	0·370	822
	1890†	67	0·305	219
Peru	1940	175	1·08	162
Switzerland	1950	198	(0·37)	535
	1934–38	173	0·374	463
	1899	157	0·398	394
	1890	139	0·396	351
Thailand	1947	395	3·91	101
Turkey	1952	735	5·78	127
	1934–38	527	3·53	149
Union of S. Africa	1951	443	1·86	238
	1934–38	309	1·76	176

* From data given in the Canada *Year Book*, it appears that this figure was *lower* than it had been in 1929. The overall rate of growth is therefore less than it appears.

† Kiaer, *Staatsoekonomisk Tidskrift*, 1892, gives an output of 147 million kr. for agriculture and 21 million kr. for fishing in 1890.

Professor Buck takes the predominant grain of that region as a base, and to convert his figures to O.U. we therefore have to multiply by different coefficients. The most productive region of China, the South-Western rice area, produces 1830 kilos of rice equivalent, or as much as 846 O.U., per man equivalent per year. The other rice areas are not far below this. In the wheat and millet growing area of Northern China, the figure falls as low as 250 O.U. per man equivalent per year. This seems to be not only the lowest level attained anywhere in the world, but also the lowest conceivable.

TABLE XX

REAL PRODUCTS PER MALE ENGAGED IN AGRICULTURE MEASURED IN O.U., 1949–52

Brazil	2060	
Ceylon	1285	
Egypt	1265	
India	585	
Java	1140	(1934–38)
Pakistan	825	
Peru	1545	(1934–38)
Philippines	1000	
China	250–850 according to region	

So far we have measured increases in gross product per man ("gross" in the sense that we have deducted only the seed, fodder and livestock used up in the actual process of agricultural production, and no other materials or services used). From the point of view of measuring agriculture's ability to supply the world's need of farm products, this is the most important thing to measure. But these rapid increases in gross output are involving also a great increase in the use, in the process of agricultural production, of goods and services from the non-farm sector. We should attempt a closer measurement of this, firstly in order to demonstrate that the net income of the farm

population is rising much more slowly than its gross product, and secondly to get some idea of the increasing demand for fertilisers, farm equipment and similar commodities.

This measurement amounts in effect, statistically, to measuring what can be called "non-factor costs" in farming.

Recent increases in productivity have only been obtained by methods which involve a complete break with the old methods of farming. The nature of this break can be most clearly understood if we bear in mind that the old-fashioned farm (including the old-fashioned English farm as it was until quite recently) strove for the highest possible degree of self-containedness. While certain implements had to be bought, the farm produced its own motive power, its own manure, its own fodder, its own fencing material, did much of its own repair-work on buildings and equipment, doctored its own animals. It was indeed this self-containedness of farm life (stretching back, probably, in modified but unbroken continuity to the "villa" which preserved a nucleus of civilisation in the barbarism of the Dark Ages) which accounted for its fascination for so many cultured minds. The farmer is now almost at one with the business man and industrialist, buying one set of commodities in order to transform them into another; and in the short space of twenty years this transformation has been extremely rapid.

We can define as factor payments all payments of the following nature:

Drawings in cash or kind by the producer and his family.
Wage and salary payments.
Rent.
Interest.
Taxation.[1]

[1] There might be some case for separating from the taxation figure an estimate of the cost of providing those public services (e.g. roads) which are specifically designed for the use of the farming community, and without which agricultural production, on its present scale, could not be carried on. Even so, it is still necessary to make a distinction between the use of such road and other services for purposes of production, and their use by the farmer and his family for household or recreational purposes.

The sum of these "factor payments" is sometimes called (e.g. by Dr. Carslaw of Cambridge in his Royal Statistical Society paper in 1935) the "social income" of agriculture, though they may appear as costs to the individual producer. The "social cost" incurred by agriculture is represented by its payments other than these "factor payments".

These include fertilisers, depreciation and maintenance of all buildings and implements, materials for fencing and draining, small tools, hire of equipment, containers, the transport of requirements to the farm and of produce to market, insecticides, payments for certain services such as insurance, telephone and veterinary treatment, and a host of minor expenses.

How far the cost of running a farmer's motor car should be treated as a cost of agricultural production is a question which must be arbitrarily settled ; and agricultural economists are often content to follow the income-tax administration rulings which impute about half of such costs to production, and the other half to household use.

Purchases of fodder, livestock and seeds are omitted because they represent the output of other farmers. However, an allowance should be included here for costs of transport and merchanting incurred by such goods while passing between one farmer and another.

There is only one of these costs which we can hope to measure for all countries, and that is the cost of fertilisers. The consumption of fertilisers in their various forms in each country has been analysed down to their essential components (nitrogen, phosphorus and potassium) and we can re-express these as real values of fertiliser consumption measured in I.U.

Costs of fertilisers are expressed in I.U. by means of coefficients which allow for the costs of transporting and distributing as well as manufacturing them.

It is interesting to see that New Zealand shows much the highest figure of consumption per man engaged, though the Netherlands leads in consumption per acre. It is also interesting to see how low consumption still is in many countries.

TABLE XXI

I.U. Values of Fertilisers

	Per Ton of 2000 Pounds in U.S.A.				Per Metric Ton I.U.	Per Metric Ton of Plant Nutrient I.U.
	Price in $ Wholesale, 1925–34	Distributive Margin, 1949		I.U. Value on Farm		
		$	I.U.			
Sodium nitrate	40·5	13·3	8·9	49·4	54·4	329 (N)
Ammonium sulphate	38·8	29·4	19·6	58·4	64·4	322 (N)
Superphosphate	8·5	16·7	11·1	19·6	21·6	135 (P_2O_5)
Muriate of Potash	12·1	30·3	20·2	32·3	35·7	59 (K_2O)

	Consumption of Fertilisers I.U. per Year per Male Engaged	
	1934–38	1950-
Argentine		2
Australia	71	128
Austria	6	11
Belgium	74	88
Brazil	—	—
Burma	—	—
Canada	9	27
Ceylon	2	4
Chile	4	6
Colombia	1	2
Cuba	3	3
Cyprus	—	—
Denmark	67	82
Egypt	7	10
Finland	11	22
France	29	33
Germany	94	70
Greece	4	10
Hungary	2	
Iceland	10	
India	—	—
Ireland	9	21
Italy	13	10
Japan	26	19
Java	1	
Netherlands	96	118
New Zealand	110	206
Norway	24	56
Pakistan	—	—
Philippines	—	—
Peru	12	
Poland	37	
Sweden	31	48
Switzerland	8*	18
Turkey	—	—
Union of South Africa	9	158
United Kingdom	41	129
United States	25	90
Venezuela	—	—
Yugoslavia	—	—

— Indicates very low figures. Blank space = no information available.

* Geering and Hotz (previously referred to) give consumption in 1890 at 5 m. fr. or 4 I.U. per head.

Other non-factor costs besides fertilisers are divided into "Depreciation and maintenance of buildings and equipment" and "Other materials and services". For Europe, a number of data are available from the E.C.E./F.A.O. study *Output and Expenses of Agriculture 1953*, and for U.S.A. from *Agricultural Statistics*. Unfortunately, for Germany and some other countries, no distinction is made between new and replacement expenditure on equipment and buildings. For United Kingdom, and Sweden up to 1930, data have already been given.

Of purchases of fodder, livestock and seeds as stated above, a certain proportion represents the cost of transporting, merchanting and processing such goods. In the United States, a comparison of the prices paid by farmers[1] for various feeds with the prices received by farmers for the raw grain or hay from which they are produced, indicates that some 25 per cent of the prices paid by farmers represents transport and merchanting costs.

To compare these costs with gross product, a diagram has to be drawn on a logarithmic scale, otherwise it would be impossible to cover the extremely wide range of real products per man-year. On such a diagram, if non-factor costs represented a constant proportion of real product, the result would be a line curving upwards; but certainly not curving upwards at the rate shown by the two principal lines, for U.K. and U.S.A. These show non-factor costs as a rapidly increasing proportion of real product. For U.K., indeed, they appear to represent over 60 per cent. This state of affairs is concealed by the fact that for the British farmer the selling prices of the products (of which milk forms a very important part) are well above their world or I.U. values, and the high ratio of non-factor costs to total product is thereby disguised.

The eye can distinguish several elements in the diagram. There is a fairly smooth curve running from the low productivity of Pakistan to the high productivity of Denmark. This curve represents non-factor costs increasing

[1] *Agricultural Statistics*, 1950, p. 633.

TABLE XXII

Non-Factor Costs in Agriculture, I.U. per Man Engaged

		Conversion Factor (i.e. millions of Units of National Currency in the aggregate corresponding to 1 I.U. per Man Engaged	Handling Costs (estimated at 25 per cent) on Fodder Seed and Imported Livestock purchased	Depreciation and Maintenance	Other Materials and Services (excluding Fertilisers)	Total, excluding Fertilisers	Fertilisers [a]
Australia [b]	1949	0·6 [c]	..	..	..	943	182
Belgium	1950	25·1	82	145	105	232	82
Denmark	1950	3·05	46	142	132	320	75
	1938–39	1·43	41	110	95	246	56
Italy	1951	5100	6	34	29	69	14
	1938	122	4	16	21	41	10
Japan	1951	185 [d]	..	50	..	77	..
	1929	0·77 [d]	..	43	..	63	..
Netherlands	1951	2·37	71	86	110	267	118
	1938	0·79	72	121	112	305	86
New Zealand [e]	1938	..	7	..	..	325	..
Norway	1951–52	2·67	25	97	43	165	25
	1938–39	1·23	26	92	41	159	26
Pakistan [f]	1949	..	..	8	..	27	..
Poland [g]	1937	19·0	24	..	..	61	29
Sweden	1951–52	5·05	12	107	52	171	41
	1938–39	2·21	11	73	30	114	30
	1926–30	2·85	..	..	..	104 [h]	..
United Kingdom [i]	1952–53	..	118	391	199	708	166
	1951–52	0·77	113	342	167	622	139
	1935–39	0·208	119	125	104	348	42
	1930–34	0·240	78	..	..	239	35
	1925–29	0·266	68	109	54	221	38
	1920–22	0·340	58	84	75	217	55
	1911–13	0·199	43	56	63	162	36
	1904–10	0·179	45	57	62	164	32
	1894–1903	0·157	48	54	61	163	31
	1886–93	0·166	35	54	59	149	23
	1877–85	0·189	29	53	60	142	25
	1870–76	0·257	19	48	55	122	29
	1867–69	0·246	18	43	54	115	24
U.S.A.	1951	12·35	135	366	338	839	83
	1939	8·59	35	126	151	312	28
	1929	11·20	33	114	137	284	26
	1920	13·70	31	129	117	277	28
	1910	6·60	24	104	84	212	23

[Notes for Table XXII on opposite page

rather more than proportionately to real product, but not much more than proportionately.

Britain in the nineteenth century lay on this curve, having in fact a level of real non-factor costs per man very similar to those of present-day Sweden. The slight change of trend began in the 1920s, and it was well away by the mid-'thirties. Productivity for the first time was increasing rapidly; but so were non-factor costs. The rise to the high point of 1952–53 was steeper than anywhere in the world.

American agriculture, up to 1939, had non-factor costs higher than those of Europe, but not so very greatly. Between 1939 and 1951 there has been a very steep rise,

NOTES FOR TABLE XXII

[a] These results are obtained from current money expenditure on fertilisers, and differ from the previous figures, which were based on physical quantities, in so far as the delivered prices of fertiliser in different countries vary in different proportions to prices in general.

[b] These data refer only to a hypothetical farm, estimated by the West Australian Department of Agriculture, of 2000 acres, employing the equivalent of 2¼ men (including shearers and casual labour), with an output of 10,000 lb. wool, 7000 bushels wheat, 50 sheepskins and 350 fat sheep, or 11,915 I.U. in all, i.e. with a productivity per man well above the Australian average.

[c] £ Australian per I.U.

[d] Number of yen per hectare corresponding to 1 I.U. per man.

[e] From a survey of costs on some 19,000 dairy farms, published in *Year Book, 1938*. Output corresponding to a full man-year was taken as 4540 lb. butter-fat, and one penny of costs per lb. butter-fat corresponds to 98 I.U. per man-year.

[f] In preparing the plans for the Thal Irrigation Project in Pakistan (United Nations, *Formulation and Economic Appraisal of Development Projects*), a 15-acre farm on sandy loam soil with a gross return of 1520 rupees per year was expected to have the following non-factor costs (rupees per year):

Agricultural	(Rupees)	Non-Agricultural	(Rupees)
Seed	100	Water charge	75
Fodder	100	Repairs	25
Depreciation of bullocks	40	Bullock shoeing and veterinary service	24
		Miscellaneous	46
		Depreciation—	
		Of buildings	20
		Of implements	20
	240		210

A farm of this size would probably represent full-time work for 1·25 men, and the rupee can be equated to 0·10 I.U.

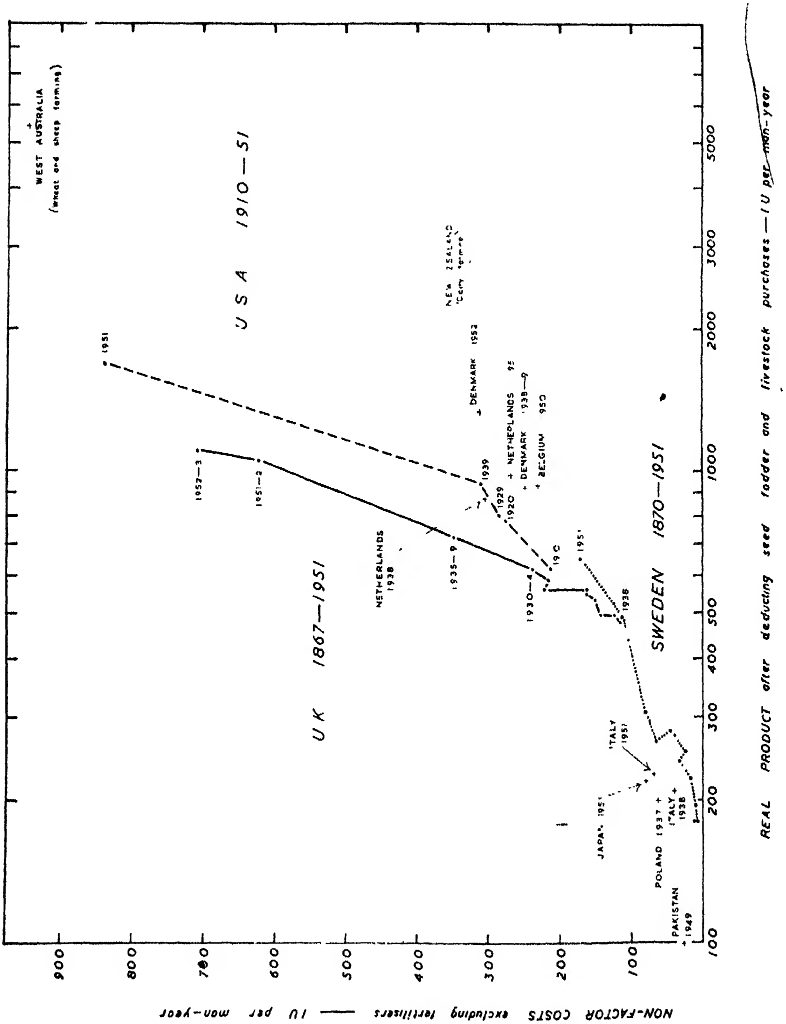
[g] Data published in *Polish National Economic Plan, 1947*.

[h] From Table XVII, which also gives a series back to 1861–65. Note that these *include* fertilisers. The values included are approximately as follows:

1926–30	24	1906–10	13	1886–90	5
1921–25	22	1901–5	11	1881–85	6
1916–20	44	1896–1900	6	1876–80	3
1911–15	14	1891–95	7	1871–75	2

[i] Great Britain only up to 1922, thereafter Great Britain and Northern Ireland. Data from Table XVII, rearranged.

accompanied, however, by a very great rise in productivity. American non-factor costs per man are 20 per cent higher than British, real product more than 50 per cent higher.



The diagram gives an impression of three parallel curves. The adoption of modern, completely mechanised, methods

of agriculture means a sharp break with old practices, an increase in productivity per man at a rate quite out of proportion to that which has gone before, and an inevitably sharp rise in non-factor costs. The whole question is, just how much increase in product is obtained in return ? For not very dissimilar levels of non-factor costs, as has been pointed out above, American agriculture shows a much higher productivity than British.

But quite a different order of magnitude again is shown by Australia and New Zealand. New Zealand dairy farming, as it was carried on in the 1930s, is of all forms of farming one of those most favoured by nature, as the climate is warm enough and moist enough to permit the growth of pasture almost the whole year round. A very high productivity was obtained, with a level of non-factor costs hardly higher than in Denmark.

The Australian figure, it must be remembered, is an estimate for a single farm under the most favourable conditions and must in no way be taken as representing a national average. (The average Australian dairy farm, for instance, will have a lower productivity than that of New Zealand.) But it shows the very high product per man which can be obtained, and has been obtained, under certain circumstances. And the interesting point is that the level of non-factor costs is not so much higher than that of the average American farm, with its much lower productivity per man.

We can analyse productivity trends in more detail by measuring the changes in the number of man-hours required to cultivate an acre or to provide for a farm animal. These are based, not on national aggregates, but on surveys of individual farms. They tend to represent the "best" methods, that is to say, not merely the best results achievable under experimental conditions, but the best methods available in practice to an intelligent contemporary farmer. Many individual farmers, whether through lack of knowledge, or lack of money to buy equipment, or for any other reason, fall short of these standards. Circumstances which enable the poor farmer

to catch up with the good may be a more important factor in agricultural progress than technical improvements themselves.

For sugar in U.S.A., data were not obtained from the source indicated, but calculated direct from the United States Department of Agriculture's estimates of man-hours devoted to sugar crops. An estimate prepared by Dr. Ker, of the Queensland Bureau of Sugar Experiment Stations, Australia, in 1936, indicated that the most efficient cultivators used only 30 man-hours of farm labour to produce the cane containing 1 ton of sugar, of which 13½ hours represented the labour requirements for cutting the cane. On the average farm, however, the figure was 50 man-hours. As compared with 50 man-hours in 1936, labour requirements were 97 man-hours in 1907. By 1951 the figure had only fallen to 45. This cessation of progress is rather startling, and is due to the rigid restrictions under which each farmer is only allowed to grow a limited quota of cane. When cutting is completely mechanised, as it is now in Hawaii, the labour requirements for cutting fall to 3 man-hours per ton of sugar. As recently as the 1930s, the man-hour requirements for cane-cutting in Hawaii were as high as 65. Low-paid Filipino labour was largely employed. It is interesting to see that Filipino and Australian cane-cutters were performing exactly the same manual operation, but one was paid 5 times as much as the other, and worked at about 5 times his pace.

In haymaking in U.S.A. the following labour requirements have been estimated.[1] For loading by hand the figure is 6·6, not very different from the present national average. With a loader and power fork it falls to 4·3; with a buck-rake and grapple-fork, sling or blower, to 2·1. A one-man pick-up baler gives the same result; a three-man baler, as used on larger farms, gives a result of 1·9.

The U.S. Department of Agriculture (Miscellaneous Publication No. 630) estimated that the agricultural

[1] *Farm Economics*, April 1945, expressed per ton (re-expressed from per acre by multiplying by a factor of 1·33).

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product of 1944 was produced at a saving in man-hours of some 9 billions (30–40 per cent of the man-hours in fact then worked) as compared with the labour required to give the same output by the methods of 1917–21. The analysis of this total is as follows :

TABLE XXIV

	Millions of Man-Hours
Tractor-operated implements	940
Saving of labour previously devoted to work animals as compared with labour devoted to machines	880
Improvements in equipment	700
Milking machines	220
Time saved by farm-cars and trucks	1400
Other mechanisation	60
TOTAL MECHANISATION	4200
OTHER FACTORS :	
Increased yields per acre	1700
Reduced overheads on larger farms	1850
Simplified methods, hire of equipment	1850
	9600
DEDUCT : More intensive labour per acre	– 600

One factor which stands out is that labour requirements in livestock production do not show the same trend through time, or between countries, as do the crop figures. These results probably indicate that, in the long period, livestock products will become relatively more expensive, and their production will be favoured in areas where labour is relatively cheap.

In the 1920s, Dr. O. E. Baker, of the U.S. Department of Agriculture, was drawing attention to the following factors in improved productivity : the replacement of beef cattle by more remunerative animals ; the release of large quantities of feed for other uses by the displacement of horses (in 1919 no less than 80 million acres of land were required for growing horse fodder, and its release

caused great geographical shifts in production, which led to advantageous specialisation); and greater output of meat through slaughtering beasts younger, and breeding better strains. It is a basic principle of livestock farming that the younger the animal the more advantageous the ratio of weight added to fodder consumed.

However, these latter trends (better strains of livestock and younger slaughter) have been less rapid than might have been supposed. If we take as given:

(i) the number of animals on farms,
(ii) the volume of fodder consumed,

the annual rate of increase of output of livestock products, over the period 1910–44, was only 0·2 per cent (J. H. Lorie, *Causes of Annual Fluctuations in the Production of Livestock Products*, University of Chicago Press).

We can analyse these trends more thoroughly by recording the number of slaughterings, and the output of meat, per head of the livestock population per annum.

All the data indicate an upward tendency in the number of slaughterings per annum per head of the livestock population, i.e. a tendency to slaughter sooner. The very low ratio for cattle in countries like Argentine, Ecuador and Colombia must not, of course, be taken to mean that the average age at slaughter is 10 or 15 years. Under circumstances where large numbers of cattle live on natural grazing, and the minimum of attention is devoted to them, a considerable number die a natural death, not being worth the trouble of slaughter. It is interesting to watch the transformation, for instance, in Australia, where few cattle are now left to die a natural death, and the average age at slaughter is approximately 4 years. In a number of European countries and U.S.A. the ratio is very much higher; but it will be seen that in U.S.A. it is showing a slight tendency to decline.

A tendency for sheep to be slaughtered earlier is clearly marked in U.S.A., and more slightly marked in Australia. There appears to have been a slight reversal of trend in Britain.

TABLE XXV

Country and Date (if Date not specified, figures refer to Average of 1930s)	Annual Output of Meat in Kilos per Head of Livestock Population			Number of Slaughterings per Annum per Head of Livestock Population			
	Cattle	Sheep	Pigs	Cattle	Cattle with Calves expressed in Adult Cattle Equivalent	Sheep	Pigs
Algeria	18·5	1·8	74·5	..	..	..	..
Argentine	59·2	3·0	14·0	0·127 [b]	..	..	..
Australia							
1910	..	..	30·1	0·170 [a]	..	0·140	0·84
1920	..	..	43·3	0·167 [a]	..	0·156	1·21
1930	33·0	..	48·9	0·222	..	0·149	1·34
1935–39	35·4	2·8	56·5	0·245	..	0·168	1·65
1947–50	37·5	3·1	67·0	0·252	..	0·175	1·35
Austria	36·0	..	..	..	..	..	..
Belgium	73·3	..	131·0	0·41	0·27	..	1·25
Canada	34·5	8·8	90·5	0·21	..	0·46	1·31
Chile	..	..	40·9	..	..	..	..
Colombia [c]	22·7	..	..	0·10	..	..	1·0
Cuba [d]	..	..	..	0·13	..	..	0·2
Czechoslovakia	40·0	..	..	..	..	..	..
Denmark	45·0	..	101·2	..	..	..	..
Ecuador [e]	..	..	..	0·076	..	0·069	0·165
Estonia	32·3	12·4	113·4	..	..	..	..
Finland	32·0	..	..	..	..	..	..
France	56·4	8·2	55·9	..	..	..	..
Germany	58·0	10·7	91·1	0·43	0·25	0·44	0·86
India [f]	1·2	2·2	..	..	..	..	..
Indonesia	..	..	..	0·18	..	..	..
Ireland	10·6	6·9	83·4	..	..	..	..
Italy	58·0	..	..	..	..	..	..
Japan	..	..	..	0·20	..	..	0·95
Jugoslavia	..	..	..	0·18	0·11	0·13	0·23
Madagascar	12·2	..	16·2	..	..	..	..
Mexico [g]	18·2	..	..	0·13	..	0·12	..
Morocco (French)	17·1	15·3	24·9	..	..	..	..
Netherlands	66·0	12·0	138·7	0·42	0·23	0·64	1·47
New Zealand	41·1	8·3	49·6	0·24	0·13	0·40	..
Norway	31·0	..	..	..	..	..	..
Paraguay [h]	32·6	..	..	0·156	..	..	..
Philippines	11·1	1·2	12·5	..	..	..	..
Poland	25·4	3·4	65·2	..	..	..	..
Roumania	22·0	..	..	..	..	..	..
S. Rhodesia [i]	10·1	0·8	18·4	..	..	..	..
Sweden	32·0	..	..	..	..	..	..
Switzerland	60·0	..	..	..	..	..	..

[contd. overleaf

TABLE XXV (*contd.*)

Country and Date (if Date not specified, figures refer to Average of 1930s)	Annual Output of Meat in Kilos per Head of Livestock Population			Number of Slaughterings per Annum per Head of Livestock Population			
	Cattle	Sheep	Pigs	Cattle	Cattle with Calves expressed in Adult Cattle Equivalent	Sheep	Pigs
United Kingdom [k]							
Before 1860	45·0	8·3	47·4	0·24	..	0·35	1·16
1860–80	50·4	9·1	71·7	0·25	..	0·36	1·18
1880–1900	56·0	9·7	72·9	0·26	..	0·37	1·20
1908 [l]	59·2	10·2	74·0	0·27	..	0·38	1·21
1935–39	67·6	7·4	100·8	0·34	..	0·37	1·45
1950–53	58·5	7·6	107·6	0·34	..	0·32	1·36
United States [m]							
1910–14	60·2	5·1	57·4	..	..	..	1·03
1915–19	55·4	5·9	57·4	..	..	..	1·05
1920–24	47·4	6·3	60·6	..	..	..	1·09
1925–29	52·4	8·0	67·6	0·46	..	0·55	1·19
1930–34	52·9	7·3	66·4	0·41	..	0·56	1·23
1935–39	53·1	7·3	77·1	0·46	..	0·58	1·30
1940–44	58·9	8·2	76·2	0·44	..	0·62	1·27
1945–49	59·1	8·6	81·4	0·42	..	0·71	1·28
U.S.S.R.							
1934 [j]	..	4·0	34·0	..	..	..	..
1938	22·6	5·2	55·6	..	..	..	..

[a] Including an estimate of 0·05 for calf slaughter, not recorded for those dates.
[b] Estimate for 1950 (*International Monetary Fund Bulletin*, 23rd March 1951). If the size of herd had been maintained, however, this figure would have been only 0·082.
[c] Data from *Foreign Agriculture* (U.S.D.A.), October 1945. Official records for the 1930s show the ratio for pigs at only 0·28.
[d] Data from International Reference Service, vol. 2, No. 9.
[e] Data for 1941–45 from International Reference Service, July 1947. "Sheep" includes goats.
[f] Data for 1945. Also 1·45 per buffalo and 2·7 per goat.
[g] Cattle data from *Foreign Agriculture*, November 1944. If the equivalent of cattle exported alive were included, these figures might be raised 30 per cent. Apparently no entry has been made for meat from calves, of which on the average only 0·5 per cow per year are reared.
[h] International Reference Service, November 1945.
[i] Excluding native slaughtering.
[j] Goats included with sheep.
[k] Including N. Ireland since 1930 — Great Britain only before that date. Data up to 1900 from Drescher, *Weltwirtschaftliches Archiv*, March 1935.
[l] Data from Hooker, *J.R.S.S.*, 1909.
[m] Liveweight converted to deadweight by factor of 0·55 for cattle and pigs, 0·45 for sheep.

It is in the case of pigs that we get some of the most drastic changes in ratios. The quickest turnover of the pig population is shown in the Netherlands, with Britain coming second. The U.S.A. figure is rising but is still below that of some European countries.

TABLE XXVI

Milk Yield per Cow in Quintals (220 lb.) per Year

Except where otherwise indicated, data for 1934–38 and 1950–52 from U.S. Department of Agriculture, *Foreign Crops and Markets*, vol. 66, No. 20 : data before 1900 from Rew, *Journal of the Royal Statistical Society, 1892*, p. 250 and *1904*, p. 417.

	Before 1880	1868–90	1890–1900	1911–13	1934–38	1950–52
Australia .	..	..	..	14·7 [a]	21·0	24·2
Austria . .	..	..	..	..	21·0	17·8
Belgium .	..	..	..	..	31·8	34·0
Bulgaria .	..	..	..	..	7·5 [b]	6·0 [m]
Burma . .	..	..	..	..	1·7 [h]	..
Canada . .	..	..	10·1 [c]	15·0 [c]	18·4	25·6
Czechoslovakia	..	..	..	..	18·0 [b]	16·0 [m]
Denmark .	..	13·3	21·5	26·2 [a]	31·3	33·6
Estonia . .	..	..	..	..	20·0 [a]	..
Finland [d] .	..	..	..	14·5	19·5	23·7
France . .	..	15·5	16·5 [e]	..	17·8	18·7
Germany .	..	..	16·8	..	24·8	26·2 [f]
Greece . .	..	..	..	..	7·5 [b]	..
Guatemala .	..	..	..	..	..	7·0 [n]
Hungary .	..	..	..	..	18·0 [b]	14·0 [m]
Iceland . .	..	..	..	..	20·0 [g]	..
India . .	..	..	..	..	2·4 [h]	..
Ireland . .	..	..	..	..	20·3 [a]	..
Italy . .	..	..	..	..	19·0 [b]	..
Japan . .	..	..	..	..	27·5 [i]	..
Jugoslavia .	..	..	..	..	13·0 [b]	..
Netherlands .	..	..	..	..	34·7	37·6
New Zealand .	..	..	16·9	..	25·8	26·2
Norway . .	..	..	..	..	16·7	21·2
Poland . .	..	..	..	..	16·0 [b]	17·0 [m]
Portugal .	..	..	..	..	11·0 [b]	..
Roumania .	..	..	..	..	13·0 [b]	..
Spain . .	..	..	..	..	10·0 [a]	..
Sweden . .	9·8 [j]	10·6 [j]	13·0 [j]	17·4 [j]	23·8	29·3
Switzerland .	..	..	24·8 [k]	..	28·5	29·6
United Kingdom	17·7	..	18·7	..	25·3	27·8
United States .	9·4 [l]	..	16·5	..	19·5	27·8
U.S.S.R. .	..	..	..	..	10·4 [a]	11·0 [a]

[a] Official estimates.
[b] Stanford University Food Research Institute War-Peace Pamphlet, No. 6.
[c] *Report on Prices*, Dr. Coates, 1915. Godfrey (*J.R.S.S.*, 1920) gives 17 for 1911 *before* deducting for calf feed.
[d] Pernu, *Agrarwirtschaft*, June 1953.
[e] Cépède (*Bulletin de la Société de Science de l'Hygiène Alimentaire*, 1936) disagrees markedly with this result, and estimates average output in 1902 at only 10 hectolitres.
[f] Western Germany.
[g] *International Institute of Agriculture Monthly Bulletin*, 1938, p. 244.
[h] *Report on Marketing of Milk in India and Burma*. The Indian figure (not the Burmese) would be raised to 3·1 if we included milk sucked by calves. The yields for buffaloes, whose milk has a fat content 60 per cent higher than cow milk, were 5·8 in India and 2·2 in Burma.
[i] *Oriental Economist*, 15th April 1950.
[j] From *National Income of Sweden* and Professor Ashby, *Proceedings of the Royal Institution*, 1942.
[k] Geering and Hotz, *Wirtschaftskunde der Schweiz*.
[l] Estimate for New York State in 1860 (*Farm Economics*, February 1951).
[m] *Economic Survey of Europe*, 1953.
[n] Higbee, *Geographical Review*, April 1947.

On milk yields per cow the information is less satisfactory. Much the highest figure is shown by the Netherlands, followed by Belgium and Denmark. These results are obtained, of course, by abundant use of fodder. The comparatively slow rates of increase in France and Switzerland are interesting.

Professor Ashby [1] gives the following figures of yield of butter-fat per cow (inclusive of butter-fat content of milk fed to stock). Butter-fat will be $3\frac{1}{2}$–4 per cent of the weight of the milk.

TABLE XXVII

LB. BUTTER-FAT PER COW PER YEAR

Denmark		New Zealand	
1861	65		
1871	90		
1881	111		
1891	148		
1903	193	1901–04	127
1914	215	1919–22	160
1924	241	1931–34	212
1930	266	1937–40	232

Per unit of labour employed, Professor Ashby found that the volume of butter-fat obtained rose 59 per cent between 1920 and 1929 : and the volume of all livestock products per unit of labour 35 per cent in the same period.

Data are also available for South Africa (Kneen and Holmes, *South African Journal of Economics*, 1935) and New Zealand (*Year Book*, 1938) in respect of labour costs per lb. Butter-fat is assumed to be $3\frac{1}{2}$ per cent and 4 per cent by weight of the milk respectively. The cost of a man-year of labour at that time was £14 in South Africa and £160 in New Zealand, and the man-hours per ton of milk 800 in South Africa and 39 in New Zealand.

We now turn to examine the figures for crop yields

[1] *Journal of the British Dairy Farmers' Association*, 1934. Later data from *New Zealand Year Book*.

per hectare rather than per man-hour. Reliable data for yields of livestock products are somewhat scanty, but for crops they are in embarrassing abundance. Tabulation is therefore confined to six of the principal crops, for which the trends of yield are shown for four periods. Years are grouped because the figures for a single year may be considerably affected by weather. The table includes all countries for which data of any interest or reliability are available. Yields, in quintals, or tenths of a metric ton, are as published by F.A.O., or by the International Institute for Agriculture for the earlier periods. Data (for wheat only) for 1885–89 from *The World Wheat Economy*, by Wilfrid Malenbaum, formerly of the Stanford Institute.

It is a commonplace that the highest yields of wheat are obtained in Belgium, Denmark and the Netherlands, in densely populated countries where comparatively little wheat is in fact grown, and that which is grown is very carefully cultivated and fertilised. Comparatively high yields are also obtained in Britain, Germany, Switzerland and New Zealand, where wheat is by no means the staple crop. With very cheap land in Canada or Australia, on the other hand, a low-yielding form of farming will be most economical.

We might at first have expected a steady upward trend in every country. It seems apparent, however, that there are a number of countries in which the trends are ominously stationary or are indeed declining. While the U.S.A. has effected such immense improvements in yield per man-hour, it is interesting to see that per unit of area it is hardly any higher than it was forty years ago. In Canada it is actually lower. There have been appreciable increases in Argentine and Australia, but only enough to bring them up to approximately the U.S. level. In most cases we have to draw the melancholy conclusion that countries which had low wheat yields per unit of area forty years ago have low yields now. In India and Algeria there has been a serious fall. Most of the countries in Eastern Europe show a downward trend or else publish no

figures at all. Productivity also appears to be stationary in Spain and Portugal and in most of the Latin American countries. Asia, Japan, Malaya, Taiwan (Formosa) and Turkey stand out for their upward trend, with figures elsewhere stationary or declining.

The story of yields of maize, which is in some ways a more demanding crop than wheat, is dominated by the sudden and remarkable rise in yields in U.S.A. during the 1940s, due to hybridisation. This event was also seen to a lesser extent in Canada and in some European countries. (It should be added, for the sake of those who ask why hybrid seed cannot be rapidly disseminated round the world, that hybrids which will give very satisfactory results in one spot may be quite valueless only 100 miles away, due to slight differences in climate; research into the most productive hybrid must be carried out separately in each area.) But before this recent increase, the trend in the U.S.A. had been downwards. A stationary or downward trend is apparent also in Roumania, Mexico, Chile, Australia and other maize-growing countries.

The most interesting feature about the table for rice is the great disparity between yields per unit area for different countries. In Spain, for a time, the yield rose to over 6 tons of rough rice per hectare; whereas in India, Ceylon, Indo-China and the Philippines, even though rice is a staple food, the yield is not much over 1 ton. These very high yields are difficult to reach and maintain, and involve the most diligent weeding and cultivation, and heavy use of fertilisers. The Spanish figure has slipped back, and Italy, which occupies second place on the list, is not appreciably higher than she was thirty years ago. Australia has shown a satisfactory upward trend, and Portugal also has given special attention to this crop. The table shows that Oriental communities, if they wish, can also attain these high yields; Japan and Egypt come close after Italy, and in Japan the trend is upwards. The yields in the poorer countries of Asia are shockingly low. If they could be raised to the Japanese level, which should be possible within a reasonable period of time, we should

get a very different idea about the ability of the land to support the population.

In sugar the diversities are greater than in rice. In most cane-growing countries a very rapid upward trend is noticeable, though in the established beet-growing countries of Europe almost the maximum yield was achieved some time ago. The rapidity with which the production of sugar per unit area can increase (the product per man-hour generally increases with equal rapidity) indeed persistently upsets the equilibrium of the sugar market. Sugar is a commodity for which most of the world (not, however, the low-income areas) has an inelastic demand. The world market for sugar expands at about 2 per cent per annum, but productivity, it is seen, can expand much faster in many countries.

Most advanced countries, in growing sugar, are able to obtain, from one hectare, 3 or 4 tons of pure carbohydrate food. In a certain sense of the words, this is the most productive possible use of the land (in a country with adequate rainfall), at any rate in a period of serious food shortage. But this is by no means the limit. The figure has risen to 6 tons in Belgium and Sweden, and higher still in tropical areas. In densely populated tropical countries special efforts are made to obtain high yields. Formosa rose to 9 tons, and Indonesia to 13 tons, though both of them have been seriously reduced since. But Hawaii had risen to 17 tons by the 1930s and now, with a system of mechanical harvesting, has risen to the astonishing figure of 20½ tons. For Peru (not given in the table) the yield has recently been about 9 tons, having risen from 5 tons in the 1920s.

The rise in productivity of potatoes has been marked in some countries. The highest figures are shown in Netherlands, Belgium and Ireland. The figure for U.S.A. has recently risen greatly, but is still below European maxima. This crop is very badly suited to warm climates.

In cotton also we see a number of examples of stationary or downward trends of yields.

[*contd. on p.* 300

TABLE XXVIII

Yields in Quintals per Hectare

	Wheat				
	1885–89	1909–13	1925–29	1934–38	1949–51
Europe					
Austria	11·1	13·6	15·1	16·7	20·3 †
Belgium	18·5	25·3	26·5	27·3	34·3
Bulgaria	9·6	10·6	10·2	12·5	. .
Czechoslovakia	6·0	. .	17·2	17·1	19·5
Denmark	25·6	33·1	28·3	30·4	38·5 †
Finland	. .	11·2	15·6	18·2	15·2
France	11·8	13·2	14·8	15·6	17·9
Germany, E.	15·3	21·4	19·8	24·6	17·9
,, W.				22·0	27·1
Greece	6·7	9·8	6·6	9·0	10·2
Hungary	12·3	12·6	14·0	14·0	13·4
Ireland	. .	. .	26·2	22·9	23·2
Italy	8·8	10·5	12·8	14·4	15·4
Netherlands	18·8	23·5	29·8	30·3	36·9
Norway	. .	16·6	17·2	20·1	19·7
Poland	8·4	. .	12·3	14·6	12·3
Portugal	6·4	6·6	6·4	9·5	7·7
Roumania	10·5	12·9	9·2	10·3	. .
Spain ‡	7·6	9·2	9·2	. .	9·1
Sweden	15·2	21·3	21·6	24·0	19·7
Switzerland	14·1	21·3	22·0	24·1	27·7
U.K.	20·3	21·3	22·5	23·1	27·3
Yugoslavia	6·9	10·5	11·9	11·4	12·4
America					
Canada	9·9	13·3	12·5	7·1	11·8
Cuba	. .	. .	. .	. .	. .
Guatemala	. .	. .	6·1	7·1	5·3
Mexico	. .	. .	5·7	7·6	9·2
Puerto Rico	. .	. .	. .	. .	. .
U.S.A.	7·1	9·8	9·5	8·7	10·6
S. America					
Argentine	6·7	6·2	8·6	9·8	10·1
Brazil	. .	. .	. .	9·0	7·0
Chile	9·5	13·5	12·1	10·6	11·4
Colombia	. .	. .	7·0	8·0	7·0
Uruguay	7·0	5·6	7·8	7·5	8·8
Venezuela	. .	. .	. .	4·9	6·8
Asia					
Burma	. .	. .	. .	4·5	. .
Ceylon	. .	. .	. .	. .	. .
India *	6·5	8·1	6·8	6·9	6·5
Indo-China	. .	. .	. .	. .	. .
Indonesia	. .	. .	. .	. .	. .
Japan	10·3	13·5	17·8	18·8	20·6 †
Malaya	. .	. .	. .	. .	. .
Pakistan	. .	. .	. .	8·5	9·3
Philippines	. .	. .	. .	. .	. .
Taiwan	. .	7·2	7·1	8·8	9·7
Thailand	. .	. .	. .	. .	. .
Turkey	. .	. .	7·7	9·9	12·0
Africa					
Algeria	4·9	6·7	5·5	5·6	5·8
Belgian Congo	. .	. .	. .	. .	. .
Egypt	16·7	17·5	17·3	20·1	18·8
French W. Africa	. .	. .	. .	. .	. .
Madagascar	. .	. .	. .	. .	. .
Mauritius	. .	. .	. .	. .	. .
S. Africa	6·0	5·7	6·0	5·2	6·2
Oceania					
Australia	5·2	8·1	7·1	8·0	11·0
Hawaii	. .	. .	. .	. .	. .
N. Zealand	17·2	19·6	22·8	21·1	27·5

* Includes Burma before 1925, Pakistan before 1934. † 1951–53.

Maize				Rice (rough)			
1909–13	1925–29	1934–38	1949–51	1909–13	1925–29	1934–38	1949–51
12·2	19·2	25·5	21·6	..	..	..	..
..	..	..	35·2	..	..	..	..
11·3	9·9	11·3	..	18·0	20·3	..	..
..	17·5	19·5	21·7	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
12·1	12·5	15·8	18·3	21·9	..	..	41·0
..	..	25·9	..	..	..	..	..
..	..	30·0	20·9	..	..	..	..
13·7	8·0	9·6	8·9	30·3	..	19·5	30·0
17·2	16·7	19·9	..	..	..	..	..
..	..	..	..	..	..	..	..
15·8	16·0	20·6	21·8 †	32·8	46·7	53·0	47·8
..	..	15·0	31·6	..	..	..	..
..	..	..	..	..	..	..	..
..	10·0	7·2	8·1	..	..	..	..
..	10·6	..	..	..	16·3	31·1	39·4
13·1	10·6	10·4	..	..	..	..	..
14·7	13·9	16·3	15·0	49·9	62·7	62·3	48·8
..	..	..	..	..	..	..	..
21·9	28·1	28·9	32·4	..	..	..	..
..	..	..	..	..	..	..	..
13·0	14·6	17·6	14·2	..	13·2	15·3	21·8
35·2	23·8	25·3	30·4	..	..	..	..
..	..	..	10·1	..	..	10·9	20·0 †
..	8·6	9·9	7·6	..	9·7	14·3	10·3
8·5	6·4	5·6	7·3	10·1	18·1	21·0	17·4
..	7·2	7·2	8·5	..	..	..	..
16·3	16·9	14·0	23·5	17·0	21·7	24·7	25·9
13·6	20·0	18·1	12·8	16·8	18·5	28·5	31·7
..	..	13·9	13·1	..	..	14·3	16·2
16·5	15·7	13·8	14·5	..	..	38·4	26·9
..	8·9	9·0	10·0	..	8·9	17·7	21·9
6·5	6·7	6·3	6·1	..	8·7	35·7	31·5
..	..	13·8	10·8	..	..	12·0	10·6
..	..	4·7	4·4	15·6	14·8	14·1	13·9
..	..	..	5·0	12·4	8·0	9·9	12·2
..	9·0	7·4	6·0	16·6	14·2	13·6	10·8
10·7	12·6	14·8	..	15·6	11·4	11·6	12·0
..	..	9·7	8·2	16·9	15·4	15·8	15·6
16·2	15·4	14·6	15·3 †	30·7	35·0	36·3	39·6
..	..	..	..	11·6	10·8	17·2	18·8
..	..	11·1	10·3	..	..	14·8	13·7
6·6	8·2	6·1	7·1	7·3	12·3	10·9	11·8
..	10·8	10·7	13·1	17·0	20·8	24·6	23·8
..	9·4	6·1	8·7	15·8	17·3	12·9	13·0
..	12·5	12·6	12·1	..	16·5	18·8	35·5
..	6·5	6·9	7·3	..	..	..	..
..	10·3	..	9·5	..	11·1	10·1	9·8
..	23·2	24·9	20·6	35·6	30·9	34·9	37·3
..	8·2	8·1	6·0	..	9·5	7·0	6·4
16·2	9·8	9·9	8·3	16·1	13·9	12·3	12·9
..	35·0	23·1	16·0	..	..	..	..
8·6	5·9	..	9·1	..	..	..	..
17·7	16·5	14·8	17·5	..	41·0	45·0	48·6
..	22·5	9·8	..	49·7	63·1	..	..
31·2	30·5	28·6	38·8	..	..	..	..

‡ 1931–35 figures shown in the 1934–38 column.

[Table contd. overleaf

TABLE XXVIII (*contd.*)

YIELDS IN QUINTALS PER HECTARE

	Sugar			
	1909–13	1925–29	1934–38	1949–51
EUROPE				
Austria	43·0	39·7	42·4	39·4 †
Belgium	44·5	41·3	47·5	62·5
Bulgaria	11·9	19·3	25·6	16·0
Czechoslovakia	..	43·4	38·8	35·6
Denmark	44·7	39·7	50·2	52·1
Finland	..	14·9	27·5	23·0
France	29·7	34·4	30·5	36·5 †
Germany, E.	45·9	40·6	42·5	34·6 †
,, W.				51·8 †
Greece	..	..	..	..
Hungary	30·9	29·3	26·9	21·2 †
Ireland	..	34·4	38·5	40·3
Italy	35·9	34·9	30·1	33·6 †
Netherlands	38·2	44·4	52·2	56·4
Norway	..	..	..	..
Poland	..	32·6	42·3	34·2 †
Portugal	..	..	..	..
Roumania	25·9	21·8	25·4	13·4 †
Spain ‡	30·0	32·3	35·6	28·7 †
Sweden	45·5	41·7	57·6	56·4
Switzerland	41·3	47·3	55·0	49·4
U.K.	..	27·9	33·8	37·1
Yugoslavia	..	21·6	27·9	15·2
AMERICA				
Canada	17·0	18·8	33·6	34·2
Cuba	38·8	38·9	46·5	46·6
Guatemala	..	41·0	..	32·8
Mexico	36·2	22·5	30·2	36·3
Puerto Rico	42·9	64·5	73·0	80·0
U.S.A.	30·4	33·0	41·6	46·0
S. AMERICA				
Argentine	20·1	26·2	21·8	24·8
Brazil	..	27·7	22·5	21·5
Chile	..	..	..	..
Colombia	..	30·3	..	..
Uruguay	..	..	..	..
Venezuela	..	..	..	..
ASIA				
Burma	..	..	..	..
Ceylon	..	..	..	..
India *	25·3	27·4	29·2	26·6
Indo-China	17·8	..	..	..
Indonesia	128·0	126·1	134·2	59·2
Japan	30·3	31·5	28·6	21·8
Malaya	..	..	..	..
Pakistan	..	..	..	..
Philippines	21·5	30·4	43·3	56·7
Taiwan	23·8	61·8	92·6	63·2
Thailand	..	..	..	..
Turkey	..	..	17·9	33·5
AFRICA				
Algeria	..	..	..	..
Belgian Congo	..	..	..	15·4
Egypt	30·0	43·2	54·1	55·0
French W. Africa	..	..	..	..
Madagascar	..	..	..	..
Mauritius	36·5	35·5	48·0	71·0
S. Africa	31·4	50·8	31·0	60·0
OCEANIA				
Australia	32·0	60·0	75·2	78·0
Hawaii	112·7	151·0	167·5	206·0
N. Zealand	..	..	..	..

* Includes Burma before 1925, Pakistan before 1934. † 1951–53.

Potatoes				Cotton (ginned)			
1909–13	1925–29	1934–38	1949–51	1909–13	1925–29	1934–38	1949–51
99	124	137	127	..	..	..	..
186	205	201	230	..	..	..	..
40	35	61	..	2·3	1·5	1·9	..
..	120	135	111	..	..	..	..
148	141	170	177	..	..	..	..
62	108	149	141	..	..	..	..
86	98	113	118	..	..	..	..
137	136	173	128	..	..	..	..
		166	216	..	..	..	..
57	36	69	107	3·0	2·0	2·7	3·1
80	74	73	66	..	..	..	..
..	160	192	208	..	..	..	..
58	56	66	67	..	2·2	2·0	1·6
143	190	201	250	..	..	..	..
151	177	175	183	..	..	..	..
..	107	138	130	..	..	..	..
..	179	175	120	..	..	..	..
86	80	89	..	..	1·5	1·2	..
116	113	112	90	..	1·2	1·3	1·1
103	116	140	132	..	..	..	..
146	150	158	179	..	..	..	..
145	167	169	188	..	..	..	..
41	50	57	68	..	1·3	2·2	0·8
108	91	88	120	..	..	..	..
..	..	79	75	..	..	..	..
..	12	28	27	..	3·1	2·5	2·7
..	31	48	46	..	2·9	2·5	3·5
..	..	..	..	..	1·1	..	..
65	77	78	159	2·0	1·9	2·4	3·1
87	66	58	62	2·9	2·6	1·9	2·6
..	100	67	48	3·0	2·2	1·8	1·5
84	98	85	89	..	..	..	..
..	27	46	46	..	1·6	1·4	2·2
..	27	41	40	..	..	..	..
..	..	16	22	..	..	1·2	..
..	..	..	..	..	..	1·0	0·9
..	..	..	..	..	0·6	0·7	..
..	..	101	67	0·9	1·0	1·1	1·1
..	..	..	..	..	0·9	1·0	..
..	52	..	..	..	..	1·4	..
98	96	107	122	3·6	2·0	2·2	1·1
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	2·1
..	26	..	..	..	1·8	2·4	2·9
..	94	..	..	..	..	..	..
..	..	..	..	..	1·9	2·8	1·7
..	22	31	73	..	1·4	2·1	2·8
28	..	72	94	..	2·1	..	..
..	..	46	64	..	0·6	1·0	1·4
..	74	139	155	4·5	4·7	5·4	4·8
..	..	..	..	..	0·2	0·4	0·4
60	36	34	37	..	1·0	..	..
..	15	..	..	..	..	..	..
33	39	48	..	1·7	1·0	0·8	1·9
68	64	71	90	1·0	2·2	1·1	1·3
31	82	44	..	..	..	..	..
141	140	135	176	..	..	..	..

‡ 1931–35 figures shown in the 1934–38 column.

Not much information is available for periods before 1909. We have the following figures for U.S.A.:

TABLE XXIX

YIELDS IN QUINTALS PER HECTARE

	1866–69	1885–89
Wheat . .	8·5	8·8
Maize . .	15·0	16·7
Cotton . .	1·7	2·0

These figures bring out how slow the advance was until recently.

In Egypt,[1] in the 1830s, the figure for cotton stood at 1·6 and for wheat at 14·3. The improvement in cotton yields is striking. Wheat yields in Egypt 2000 years ago [2] were 19 quintals per hectare, at a time when, in Attica, the figure was only 9—very similar to that of present-day Greece. In France [3] wheat yields were only 6·2 in 1789. According to D'Avenel the figure stood at about 10 in the 1860s and 11 in the 1870s.

The Japanese rice yield stood at about 20 in the 1880s,[4] since when the rise is seen to have been slow but steady.

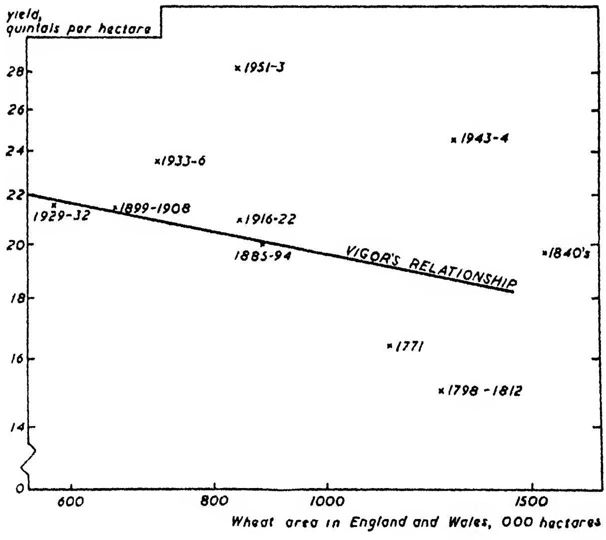
English data are available back to the eighteenth century; the available evidence was summarised by Dr. Drescher.[5] The well-known history of poor yields, and of high prices and rents, when an increased acreage had to be cultivated during the Napoleonic wars, suggest the formulation of a Diminishing Returns law. This problem was examined by H. D. Vigor [6] who made a comparison county by county, rather than on time series, comparing the decade 1899–1908 with the decade 1885–94. He found a regression linking the reduction in a county's acreage with

[1] *Milbank Memorial Quarterly*, January 1949.
[2] Professor Michell, *The Economics of Ancient Greece*.
[3] Neymarck, *Journal of the Royal Statistical Society*, 1889.
[4] Sato, *Economic Journal*, 1918.
[5] *Weltwirtschaftliches Archiv*, March 1935.
[6] *Journal of the Royal Statistical Society*, 1910, p. 396.

the increase in yield per acre. The slope of his relationship is plotted on the diagram.

A relationship of this nature can only be expected to hold while technical methods (plant breeding, fertilisers, etc.) remain unchanged. It is, in fact, surprising that something like this relationship did appear to hold over so long a period, from the 1840s to the 1920s. Earlier, the yield, for a given extent of cultivation, had been definitely lower, and since 1932 has been definitely higher. Even the

WHEAT AREA AND YIELD IN ENGLAND AND WALES



very extensive area cultivated in 1943–44 showed a somewhat higher yield than had prevailed in 1933–36. The Diminishing Returns relationship probably still holds, though masked by the general upward trend. But the important point to notice is that, even during the period in which it prevailed, the slope was only 0·2, i.e. a 10 per cent increase in area led to only a 2 per cent fall in unit yields.

We may conclude by examining the extent of tractor utilisation in agriculture at the present time, or at past dates whenever the information was available. The best

standard of comparison is to take the number of tractors per 1000 males of the agricultural labour force.

TABLE XXX

TRACTORS PER THOUSAND OF AGRICULTURAL LABOUR FORCE
(about 1951 unless otherwise stated)

Algeria	8	Italy	10
Argentine	19	Netherlands	37
Australia	235 *	New Zealand	365
Austria	35	New Zealand (1938)	45
Belgium	29	Norway	36
Brazil	4 †	Peru	3
Bulgaria	4	Poland	3
Canada	4	Portugal	4
Chile	10	Roumania	3
Colombia	3	S. Rhodesia	12
Cuba	11	Spain	4
Czechoslovakia	26	Sweden	138
Denmark	66	Switzerland	53
Egypt	1	Turkey	4
Finland	32	Union of South Africa	29
France	44	United Kingdom	313
Germany, E.	30	,, (1936–39)	60
,, W.	77	United States	554
Germany (1937–38)	15	,, (1939)	174
,, (1928–29)	5	,, (1929)	93
Greece	4	Uruguay	85
Hungary	8	Yugoslavia	2
Ireland	34		

* On the hypothetical farm in West Australia used for computing non-factor costs, the ratio was 445.

† Lima, "Brazilian Agriculture", *I.S.I. Proceedings*, 1953. The same author shows, however, that the number of *ploughs* per thousand cultivators was still only 165 in 1950. It was 57 in 1940 and only about 20 in 1920, of which half were in the province of Rio Grande do Sul (Gourou, *The Tropical World*). All the rest of the work was done with hand tools.

The results are of some interest. The highest figures are for the United States, Canada and New Zealand. But the results are by no means perfectly correlated with productivity. Australia has fewer tractors per 1000 workers than the United Kingdom, and the highest figure on the continent of Europe is that of Sweden, not Denmark.

It is a mistake to think that the degree to which tractors are utilised in different countries can be estimated by simple comparisons of the costs of labour, or even upon

the relative prices of labour and fuel. The extent to which tractors will be used in the agriculture of different countries does in fact depend upon a most complex number of economic affairs, which have been most ably analysed by Dr. Jasny.[1] Although the figures have now become out of date, the principles on which the problem should be analysed remain.

In the first place we must take into account the constancy or intermittency of the work. The more intermittent the work, the greater the relative advantage of the tractor. This explains why the tractor was first introduced into the predominantly grain-growing areas of Western U.S. and Canada, but was relatively much less advantageous in the mixed farm areas of Europe where work for horses is available nearly all the year round.

The reason for this relative advantage, of course, is that horses have to be fed and cared for whether they work or not, while tractors do not. The horse, unexpectedly, has a much higher " overhead " than the tractor.[2] Indeed it may have been largely a desire to get some return from his horses that led the European farmer (until recently at any rate) to devote a substantial proportion of his land to growing turnips and similar fodder crops. A German horse in the 1930s, according to Dr. Jasny, worked 2000 hours per year. In the early 1930s it was estimated that an American farmer who had 1500 hours a year work for his horse would find his costs of cultivation as low as they would have been had he had the same amount of work performed by tractor. In Canada, where labour and fodder costs were lower, the line was crossed if the farmer had 1100 hours work available. However, not many American or Canadian farmers had this amount of work for their horses. With the decline in fodder crops, manure-spreading

[1] *American Economic Review*, 1935, p. 708.

[2] This was even more marked in the nineteenth century, when fodder prices were much higher, relative to wages and other costs, than they are now. McCulloch in 1837 estimated the cost of a farm horse's keep at £40 per annum — far higher than a man's wages at that date. By the 1850s the cost of feeding a horse engaged in hard railway construction work, according to Brassey, was as high as £90 per annum.

and similar activities, the average hours worked per horse [1] had fallen from 1000 in 1914 to 800 in the 1920s and 500 in the 1930s. In Canada, at that time, the average hours worked per horse were still about 770.[2]

Average hours per tractor have risen, presumably as they have become more reliable. The following estimates have been prepared by F.A.O. [3]

TABLE XXXI

AVERAGE HOURS PER YEAR WORKED BY TRACTORS

U.S.A., 1920–22	181
,, 1935–37	466
,, 1941	497
,, 1947	592
Switzerland, 1949	600
United Kingdom, 1949	800
Argentine	1000
Mexico	1000
U.S.S.R. collective farms, 1936	800–1600
U.S.S.R. machine tractor stations, 1940	1100

Dr. Acock regards the average life of a medium-sized wheel tractor as 6–7000 hours, irrespective of the average hours per year, and which may therefore be spread out over more years in some countries than in others. It is the increasing number of hours per year for which tractors can be used, and the rising costs of labour and fodder for horses, which have shifted the balance in favour of tractors during recent years. But still it is not the same in all countries. In Australia and the Argentine fodder is less than half the U.S. price, and fuel and lubricants, owing to transport charges and taxation, about 25 per cent more costly than in U.S.A. Fuel and lubricants represented 42 per cent of the cost of tractor work in U.S.A. in the 1930s, probably a little more now. For these reasons the use of tractors has proceeded less rapidly in those countries.

[1] University of Illinois, Agricultural Experimental Station, *Bulletin* No. 647.
[2] Somerfield, World Grain Conference, Regina, 1933.
[3] Dr. Acock, *Farm Mechanization*. The two earliest U.S. figures are obtained from the previous sources.

Dr. Jasny calculated for the 1930s that the "replacement point" would be as low as 350 hours, i.e. that tractors would be used only for the most intermittent work. But an interesting and paradoxical example in the other direction is provided by Switzerland, where fuel is no more costly than in U.S.A. but fodder is two and a half times as expensive, and where tractors therefore were used early and extensively, in spite of the small average size of the farms.

Having studied gross and net product per man, and per unit of livestock, we are also bound to be interested in the amount of product per unit area. It is immediately apparent, however, that we will distort our results if we try to measure agricultural product per square kilometre in countries which contain large areas of desert or tundra. Some formula for eliminating land in which agriculture is impossible, and giving a low weight to land in which it presents peculiar difficulties, is necessary.

The classification which follows is based upon climate only. It may be objected that land which is climatically suitable for agriculture may well be difficult or impossible to cultivate because of (1) poor soils, (2) rugged topography. Many of the world's best farmlands today were, however, originally poor soils, and all such soils can be made cultivable with the use of adequate fertilisers. Where topography is very rugged, agriculture is certainly very difficult except for small-scale farmers who are willing to cultivate small plots or graze steep slopes. However, there is at present no satisfactory standard for demarcating such areas on a map. The amount of land climatically suitable for agriculture, which cannot in fact be farmed owing to rugged topography, probably does not constitute a very large proportion of the whole.

Land with the climate of the principal temperate and sub-tropical farming regions of the world is defined as "standard land", and other climates converted into "standard land" by appropriate coefficients. The true tropical climates, in which sunlight and rainfall are continuous, are capable (with sufficient fertiliser) of yielding two cereal crops a year, and are rated at double standard

land. The coefficients given to other climates are based on estimates of the annual yields of dry-weight fodder obtainable from them (fodder crops and grasses, of course, give a much greater weight than cereals). "Standard land"—not all of it, but in areas which have both reasonable warmth and humidity throughout the year—can yield about 13½ tons[1] of dry weight per hectare per year, and the other areas in proportion.

For the semi-arid climates the coefficient of one-thirtieth is estimated after examining the economic value of the yield from livestock grazing such areas in Australia, as compared with standard farm land in the same country.

The climatic classification of Professor Thornthwaite (*Geographical Review*, July 1933) is used. The symbols A to E indicate a rainfall scale, and A′ to F′ a temperature scale, the third symbol indicating whether rainfall is regular, or shows a winter or summer deficiency.

The areas under the different climates are converted to standard by use of the following equivalents:

I.	A A′ r, B A′ r, C A′ r (tropical climates with regular rainfall capable of growing two crops a year)	2
II.	Rest of A and B (wet or humid sub-tropical and temperate climates, tropical climates wet or humid, but with irregular rainfall)	1
III.	C B′ r, C C′ r (sub-humid climates, rainfall distributed through all seasons)	$\frac{5}{6}$
IV.	C A′ w, C B′ w, C B′ s, C C′ s (sub-humid climates, rainfall deficient in winter (w) or summer (s))	$\frac{2}{3}$
V.	C A′ d, C B′ d, C C′ d (sub-humid climates, rainfall deficient in all seasons)	$\frac{1}{2}$
VI.	D climates (semi-arid, suitable for sparse pasture, rainfall too uncertain for cropping)	$\frac{1}{30}$
VII.	E climates (arid).	
VIII.	D′ climates (described as "taiga"). *See below.*	
IX.	E′ and F′ climates (tundra and perpetual frost) . . .	0

In the above analyses moisture rather than temperature has been taken as the limiting factor in crop or pasture

[1] Professor Farrington Daniels in a paper at the World Population Conference, 1954, pointed out that the cultivation of algae might yield 50 tons of organic matter, dry weight, per hectare per year — which would correspond to 2 per cent of the total solar energy falling upon it.

growth. This is in fact the case over the larger part of the earth. A cold (C′) climate associated with high rainfall is comparatively rare — Newfoundland is an example — and in such cases temperature is the limiting factor, and plants do not use all the available moisture. But in most C′ climates the rainfall is comparatively low and the summer growing season suffices to use up the available moisture — i.e. moisture is again the limiting factor, and land with a C C′s climate on the Russian steppes is of about the same agricultural value as C A′ w land in India with a far higher temperature.

By irrigation, cultivation can be freed from the controlling factor of rainfall and crops grown up to the limit set by the available sunlight. In cold climates irrigation is not likely to be of much value as the natural moisture supplies are generally about in equilibrium with the available sunlight. But nearer the equator sunlight suffices for growing up to two or more crops a year, if rainfall is regular; and any warm region with irregular rainfall can benefit by irrigation — may indeed be rendered even more productive than the wet tropics, through freedom from the cloudy skies, floods and soil-leaching which go with excessive tropical rainfall.

In certain countries (indicated by footnotes to the main table) a large proportion of all the cultivable land is under irrigation; and in these cases the area of irrigated land is treated as the equivalent of climatic Zone 1 (capable of growing two crops per year). No entry has been made, however, for the amount of irrigated land in countries in which it is relatively of small importance.

The large area which Professor Thornthwaite has classified as "taiga", or land on which the natural vegetation is coniferous forest, requires further examination. It is clear that the warm part of it, at any rate, is cultivable. This area was further subdivided in accordance with its "accumulated temperature" measured in "month degrees". Crops and grasses, it is generally agreed, only begin to grow if the temperature has risen above 5° C. (43° F.); and the greater the excess above this limit the

greater the rate of growth. The device of "accumulated temperature", as used for instance by Professor Austin Miller,[1] is to add together, for all months in which the mean temperature exceeds 5° C., the amounts of such excess. Professor Miller's map, unfortunately, does not make an adequate subdivision of the "taiga", and the demarcation had to be made from original data.[2]

The agricultural significance of various levels of "accumulated temperature" has been carefully examined in Finland.[3] It was found that, in those regions of Finland where "accumulated temperature" exceeded 38 month-degrees, all the usual European crops could be grown, including winter wheat and sugar beet. Such land is therefore deemed to have full agricultural value. By the time the number of month-degrees has fallen to 30, sugar beet and winter wheat and peas are ruled out, though spring wheat is still possible. At the 23 month-degrees level the climate is too cold for turnips, not satisfactory for spring rye and on the margin for oats, but still satisfactory for winter rye. At 18 it is still possible to grow Timothy hay and some of the new strains of barley, and potatoes possibly in a colder climate still.

Taking this information into account, the taiga zone is subdivided as follows :

TABLE XXXII

	Month-Degrees	Equivalent of Standard Farm Land
VIII. A . .	Over 38	1
B . .	30–38	$\frac{9}{10}$
C . .	23–30	$\frac{7}{10}$
D . .	18–23	$\frac{1}{2}$
E . .	Under 18	0

[1] Institute of British Geographers, *Transactions and Papers*, 1951, Publication No. 17.

[2] I am much indebted to Mrs. Margaret Rutherford for a careful survey of all the available geographical information, and for calculating the "accumulated temperatures" for a large number of points in the Northern Hemisphere.

[3] Results published in *Fennia*, "A General Handbook on the Geography of Finland", Helsinki, 1952.

[illegible]	[illegible]	..	[illegible]		5·3
Rest Africa : British	5,281	220	368		6·3
Other	22,787	3,455	1,113		2·2
TOTAL AFRICA	30,289	3,675	1,512		..
China [f]	9,736	..	1,530		24·5
India and Pakistan [i]	4,288	215	255		31·2
East Indies [k]	2,125	1,412	713		5·7
Japan	369	..	369		23·8
Korea	221	..	101		35·5
Philippines	299	195	104		7·5
Rest of Asia, S.E.	2,062	712	1,088		6·5
,, S.W.	6,286	..	..		24·5
Australia	7,704	11	467		0·3
New Zealand	268	..	268		0·4
Rest Oceania	588	290	293		0·5
TOTAL ASIA AND OCEANIA	33,946	2,835	5,188		..
WORLD TOTAL	131,153 [p]	10,196	18,956		..

* Allowance is not made, either in this figur inland water, except for the countries marked with is relatively large).

[a] Including Newfoundland
[b] Excluding outlying possessions.
[c] Excluding Greenland.
[d] Balance has been arbitrarily apportioned bet
[e] Accumulated temperatures have not been apportionment has been made between the sub-Zo
[f] Includes Northern Ireland.
[g] Excluding U.S.S.R. and Turkey.

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It now becomes possible to classify all the agricultural or potentially agricultural land in the world according to these climatic zones. The extent of utilisation is shown by the number of males engaged in agriculture per square kilometre of equivalent standard farm land.

The greatest density of settlement, in relation to the area of standard farm land cultivation, is in Egypt. High figures are also shown by all the countries of South-West Asia, India, Pakistan, Japan, China and Korea; and by a number of countries of Eastern and Southern Europe.

The use of countries or regions as units conceals the high densities which prevail in certain limited areas. Thus the island of Java is exceedingly densely settled, but once we consider Indonesia as a whole, with its large uninhabited areas on the other islands, the ratio of population to cultivable land appears low. Dense populations on some of the islands in the Caribbean are also concealed in the general figure for that region.

The density figure comes out surprisingly low for the U.S.S.R. Here also the standard farm land is densely settled. A large proportion of the available land is in the sub-Arctic zone in Siberia, much of which is still uninhabited. Very large capital outlay in draining swamps, clearing forests and providing means of transport will be necessary before this land can be farmed.

However, the world still has, as can be seen, very large reserves of farm land capable of cultivation. It is only recently that agricultural science has revealed the potentialities of cold-climate farming, and besides Siberia there are large areas in Canada and Alaska, and some in Norway and Sweden, which can be further exploited. The farm land of the U.S.A. is fairly clearly under-utilised, but the largest blocks of under-utilised land are in tropical Africa and America; together with (surprisingly enough) a considerable amount in South-East Asia, and some in Australia and New Zealand.

This apportionment of the world's area may be compared with that made (before the Thornthwaite climatic

classification was prepared) by O. E. Baker.[1]

Baker's idea of the land too cold for cropping is considerably more extensive than that shown in Table XXXIII. However, much of the information about agricultural potentialities in cold climates has only recently become available. His demarcation of the land too arid for cropping agrees fairly well with the totals given for Zone VI and Zone VII (subject to the qualification that Zone VI can be used for grazing). This leaves a general agreement about the demarcation of the other zones, including the sub-humid Zone V.

TABLE XXXIV

POTENTIAL AGRICULTURAL LAND IN MILLIONS OF SQUARE KILOMETRES

	World Total	Tropical and Sub-tropical Lands included therein
Total area	135·0	59·7
Too cold for cropping . . .	16·6	. .
Too arid for cropping . . .	40·5	20·6
Suitable for grazing only because of topography . . .	51·8	21·9
Balance suitable for cultivation .	25·9	13·0
Of which cultivated in 1923 .	9·6	3·1
Grazed only in 1923 . . .	5·4	1·6
Not used in 1923 . . .	10·9	8·3

Of the land climatically suitable for cropping, Baker separates out as much as 52 million square kilometres to be reserved for grazing only on grounds of "topography". He must have foreseen the experiments with which the world has recently become more familiar, showing that even on slopes as gentle as 1 in 20 erosion may occur if the land is ploughed under certain circumstances. A much more detailed topographical survey is necessary before we can give much precision to this figure, although it is admittedly important. The danger of erosion seems to be greatest in areas of light and uncertain rainfall. It may be added that in a high rainfall area, land which is,

[1] *Geographical Review*, 1923.

for its slope or for any other reason, kept in permanent pasture, and carefully fertilised, may be more productive than crop land.

The outstanding examples of land in Zone V, of near-arid crop land, are in the U.S.A. and China. Baker has elsewhere estimated [1] that what we might call the equivalent area of standard farm land in China is 2830 square kilometres (this figure apparently refers to China proper, excluding Tibet and Mongolia). Much less than this is actually cultivated, and Baker reaches the interesting conclusion that the Chinese farmer will only cultivate land where the rainfall is abundant and certain. If there is the slightest danger of drought, the land is left for grazing. Indeed, he reached the paradoxical conclusion, which no one else seems willing to take up, that if China were settled by farmers of the western U.S. or Australian type, who are willing to face the risks of an occasional drought and possess mechanical equipment to cultivate large areas, the aggregate food output of China would be greatly increased.

An attempt may be made to relate density, as measured by the number of males engaged in agriculture per square kilometre of standard farm land to real product per man, and to show a " Diminishing Returns " relationship. But this is only true in the most general terms. It is true that New Zealand, U.S.A., Canada and Argentine have low densities of settlement, and high productivity; while at the other end of the scale we find the densely populated countries of the Middle East and the Far East. But the exceptions are more interesting. Italy has a density of settlement comparable with many Eastern countries, but a considerably higher productivity. The U.S.S.R., even if we exclude all the uninhabited cold-climate areas, has a density of settlement only comparable with that of Denmark; but Denmark has an immensely higher productivity. One of the most productive agricultural economies in Europe is that of the Netherlands, which is also one of the most densely settled. We can also find

[1] Farm Economic Association, December 1927.

examples of other countries with a low density of settlement and low productivity.

It appears that the different methods of agriculture adopted in different countries — it should be added that modern commercial agriculture only becomes possible in a country which has a good system of transport and communications — serve to suspend the application of the Law of Diminishing Returns, at any rate its literal application. We have some chances of observing the working of such a law when we are able to compare the different regions within a single country, so long as the country is fairly homogeneous and we can assume that more or less similar agricultural methods will prevail. Thus, in the official Spanish publication *La Renta nacional*, data are given for average agricultural income per head in different provinces, as compared with the density of settlement. If these two variables are plotted on a double logarithmic diagram, a fairly regular relationship is found, with income decreasing with density at a slope of 0·4 (i.e. income is inversely proportional to density raised to the power of 2/5). Mr. Bilkur gives, in *National Income of Turkey*, some data of the value of the agricultural output of each region in 1943. Here the relation is not so close and the slope, if any, is much smaller, probably of the order of 0·25.

It may be asked whether there is any absolute standard of excessive density or " Rural Over-population ", in the sense that, once a certain density has been passed, there is not enough work on the land to keep the men fully occupied, and we get the phenomena of " disguised unemployment ". That such " disguised unemployment " among agricultural populations occurs at certain places and times is clear enough. Indeed, we can estimate fairly precisely the amount of land per man at work which is needed to keep an agricultural population fully occupied, if we know what system of agriculture they are following. The difficulty is that systems of agriculture may change and may show widely differing requirements of land per man. The changes are sometimes upwards, and sometimes downwards. Our most primitive ancestors, who lived entirely

by hunting and fishing, required very large areas of land for this purpose, and no doubt fought any rivals who trespassed on their hunting grounds. With domestication of animals the necessary area was greatly reduced; once primitive agriculture with hand tools had been initiated, it became possible to support a very dense population on a limited area, in favourable climates. Such agriculture is still being carried on in many parts of the world today. But the introduction of the ox plough — the agricultural technique of Eastern Europe and Asia today differs very little from that of Hesiod and Virgil — made it possible for each man to cultivate a larger area, and the horse plough more still.

The next stage of development came in the nineteenth century, and had an effect in the opposite direction, of making an *increased* density possible. Up to that time most villages had to be largely self-contained, and produce the main crops within their own borders, owing to the high cost of transport. With railway transport and good roads a great deal more agricultural specialisation became possible and many cultivators concentrated on high-valued "industrial crops", such as flax and sugar beet. In the modern world an agricultural district like Flanders can carry without "disguised employment" an agricultural population of a density which would be regarded as hopelessly excessive in Eastern Europe.

It is worth while trying to attach more precise figures to these stages.

The density at which a primitive population can live has been approximately estimated. Expressed as adult males per square kilometre, Rätzel's estimates [1] designate the following ranges of possible density:

Primitive agriculture in settled villages .	0·6–2·0
Primitive herdsmen	0·25–0·6
Shifting cultivators	0·06–0·25

For still more primitive peoples, living by hunting, the figure may be as low as 0·004 in the poorest territories

[1] Quoted by Taylor, *Canadian Journal of Economics and Political Science*, August 1950.

(e.g. Australia), but rising to 0·03 in well-watered country.[1] In modern hill sheep farms in Scotland the density is still only about 0·5 man per square kilometre.[2]

We may next consider the possible densities of settlement of primitive cultivators, which may be very high. However, we must remember that a true "subsistence agriculturist" does not work very many hours a year, at any rate not at agriculture. He has to devote a good deal of time to making tools, clothing, etc. In the highest rainfall areas in the Cameroons, with double cropping, and a diet of bananas, yams and other high-yielding crops, we find densities up to about 400 per square kilometre of *cultivated* land (in fact, this is an area of shifting cultivation, and density per square kilometre of *total* land is very much lower).

When transport and communication improve — but not until then — the cultivator begins to produce crops for sale as well as for subsistence, and to buy textiles, tools, etc. To make this transformation possible, the primitive peasant needs more than contact with the outside world: he needs also a road or rail system good enough to carry away bulky farm products at low freights and, more important still, a political order under which he can feel secure against raids, and against arbitrary exactions. He then begins to work longer hours at agriculture and requires *more* land to keep himself fully occupied.

In the Gambia, a cash-cropping area, Miss Haswell[3] has estimated that a density of only 31 represents full employment for the men. The higher densities found in some (but comparatively few) areas in West Africa, e.g. 80 in some Hausa areas, and as much as 130 on the Benin Sands area in South-East Nigeria, indicate either under-employment or a relapse from cash to subsistence cropping.

But all these figures are of land under "shifting cultivation". If really abundant supplies of chemical

[1] Estimated by Professor Childe. On the shores of some of the salmon rivers on the Pacific Coast of N. America, a primitive fishing population lived with a density as high as 0·2.

[2] Snodgrass, *Geographical Journal*, April 1941.

[3] *Economics of Agriculture in a Savannah Village* (Colonial Office).

and organic manures were available, but the land were still cultivated with hand hoes (this combination of conditions is not of course likely to occur in fact), the above figures could probably be sustained permanently. But as things are now, the tropical peasant cultivator has to aim at cultivating his land on the average for only one year in seven. Even in the second year, it was found in Yucatan, yield fell 25–50 per cent below that of the first.[1] Lacking any other fertiliser, he has to rely upon the natural recuperative powers of the quickly growing forest and scrub, which draw fresh supplies of minerals up from the deep subsoil, and restore the organic matter and nitrogen in the soil. With such a rotation, the number of cultivators per square kilometre of cultivable land, including fallows, is found in Sumatra (for a people growing only food, and not cash crops) to vary between 10 and 25, according to the fertility of the soil. Per square kilometre of total area, these figures must be approximately halved, to allow for land too rough or too swampy for cultivation.

Even in this way, Professor Gourou believes that he has still over-stated the capacity of tropical land to support a population living by shifting agriculture. He quotes a detailed study (made by Redfield and Villa) of the Mayan village of Chan Kom, in Yucatan, where even a population of 10 persons (say 3·3 cultivators) per square kilometre has proved excessive in the long run. The village has a population of 251, on 24·5 square kilometres. Only 1·2 square kilometres will be cultivated in any one year. The usual custom is to cultivate for two years and then fallow for seven; but it appears that, at this rate, a good deal of the land is never cultivated at all. This is, however, a cash-cropping economy, growing more than twice as much food as it consumes. The cultivated area yields about 1440 kilos of maize per cultivator per year, while consumption is only 645 (215 per person). The village was only formed some fifty years ago, but is already beginning to show signs of disintegration. People are leaving it and beginning to cultivate plots outside.

[1] Professor Gourou, *The Tropical World.*

In the Maya civilisation of the sixth century A.D. agricultural methods were the same as those of the Mayas of the present day. In some districts their population density appears, from counts of the numbers of houses, to have been 60 persons (say 20 cultivators) per square kilometre — indeed without such a population density they could hardly have constructed such magnificent buildings. Professor Gourou believes that so dense a population, using these methods, must inevitably have been confronted before long by an exhaustion of soil fertility, and have been compelled to scatter again. In this factor alone he can see the cause of the disappearance of the Maya civilisation. (It seems to be implied that the Inca and Aztec civilisations, also dependent upon maize grown by hand cultivation, but which survived for centuries, can only have done so because they were located on much more fertile soil.)

There is another very important point which Professor Gourou makes but perhaps does not emphasise enough. Geographers distinguish clearly between "savannah", or what the early English explorers in Africa used to call "park-like country", from a predominantly grassland landscape, though precisely what combination of soil and climatic factors causes the difference is uncertain. There is now increasing evidence (including some from Australia and New Zealand which Professor Gourou does not mention) that repeated burning will change forest into savannah, and will indeed "nibble at the edges" of the most dense tropical rain forest. The whole rationale of shifting cultivation in thick tropical forest is that during the fallow periods the dense growth of trees restores the mineral and organic content of the soil. Once the country has been converted to savannah this is no longer possible. The fertility of the soil, and its capacity to support a population who use primitive methods of agriculture, is considerably decreased — though here again the capacity would be quite different for people using modern agricultural methods and chemical fertilisers.

Professor Gourou also estimates a low figure, of 2½–3

cultivators per square kilometre, as a maximum satisfactory density for growers of "upland rice" on the Ivory Coast in Africa. This crop of course can be grown in areas of lower rainfall than ordinary rice, but presumably requires shifting cultivation. However, he quotes a much higher figure for density of tropical population in one province of Guatemala, namely Sacatepequez. It is highly significant that this is the only malaria-free province in Guatemala, and probably uses more advanced methods of agriculture. Here the total population is as high as 120 per square kilometre, representing probably 30 male cultivators per square kilometre. It is worth adding that, at any rate until recently, the owners of coffee plantations in Guatemala persuaded the Government to give them powers to impress forced labour. This is certainly a very great evil; however, it does not indicate that the country is overpopulated, but the reverse.

Professor Gourou concludes his analysis by establishing some "records" for density of rural populations. Measuring in total population per square kilometre, divided by 4 to make comparable with the units which we have been using hitherto, the highest European figures are 113 for the Valencia district of Spain and 162 in some parts of southern Italy. In the Tongking delta in Indo-China the maximum [1] density in some areas rises to 240 but the world record is claimed by the Adiwerno district in Java, totalling 93 square kilometres in area, largely engaged in growing sugar cane as well as rice, where the figure rises to 415.

From Table XXIII above, which gives the number of man-hours required to cultivate a hectare of rice by Oriental hand-labour methods, and assuming that a 3000-hour year is worked, the number of men who can be fully occupied on 1 square kilometre of land works out at 42. A similar calculation gives 25 for maize (which is a more labour-intensive crop than wheat), and Professor Gourou has computed 35 for rubber.

[1] The average figure for Tongking, which is much lower than this, is given in Table XXXV.

Nobody is likely to estimate much higher the number of men who can be occupied on one square kilometre. Professor Bonné gives for Egypt a figure of 50. This is for very fertile irrigated land in a hot sunny climate, generally capable of growing two crops a year. Professor Bonné points out that similar land cultivated in California only occupies 10 men per square kilometre (and they only work about 2250 hours per year).

The next step in our analysis is to record all the available direct evidence about unemployment of rural labour. Such evidence sometimes takes the form of the average number of days per year worked by a representative sample of rural workers. At other times it may be a round figure stated from general impressions; but such a figure from a really experienced observer is, in many cases, of greater value than a collected sample.

If, for example, we find that a population settled at a density of 50 is only 60 per cent occupied, we deduce that 30 represents the "full employment" limit. It is soon apparent that these results will show great divergencies.

There is a remarkable uniformity among the figures for the Mediterranean countries: rather less for the higher rainfall countries. The peculiar circumstances of nineteenth-century Ireland are discussed in the footnote to Table XXXV.

We are left with the very interesting problem of the differences between the provinces (now States) of India. Mr. Tarlok Singh[1] made estimates for the different provinces of India and Pakistan by an interesting alternative method which is based principally on the number of ploughs. He reasons that a village may contain a great many more men than the land requires, but that cultivators, on the whole, are not likely to go to the expense of providing more ploughs and plough teams than the land can reasonably occupy. It is an ingenious argument, but it must not be pushed too far.

By this reckoning he ascertains the number of men

[1] In his book *Poverty and Social Change*, published in 1945. Mr. Tarlok Singh is now a prominent official of the Planning Commission.

[*contd. on p.* 321

TABLE XXXV

Estimates of Under-utilisation of Rural Labour

Country	Area * in 000 Sq. Km. Cultivated	No. of Males Engaged in Agriculture (millions)	Males per Sq. Km. of Cultivated Area	Estimated Percentage a Utilisation of Labour	Computed "Full Employment" Limit	Source
Largely hand cultivation						
Indo-China (Tongking delta)	..	..	113	42	47	Gourou, *Tropical World*
Egypt . .	24	3·6 (1937)	150	38 b	57	K. Murray, *International Affairs*, Jan. 1947
Indian Provinces						
India, (1941) Bengal	..	11·1 j	61 j	60 k	37	All-India Congress Committee, Agrarian Reforms Sub-Committee 1949. Privately communicated by Mr. G. S. Gouri
United Provinces	..	12·4	53	59 l	31	
Punjab . .	..	4·25	22	50	11	
Bihar and Orissa	..	9·5	49	not above 67	30	
Bombay Province	..	3·1	16	83	13	
European good rainfall						
Bulgaria . .	36	1·35 (1934)	37 bb	87	32	Egoroff and Mollow c
Hungary (1939) .	53	1·5	28	76	21	Matolcsy, quoted *International Labour Review*, April 1939
Yugoslavia .	79	3·2	41 f	62	25	Bicanic, *Geographical Journal*, Jan.-Feb. 1944
Poland (1938) .	189	5·4	29 g	75 h	22	*World Today*, Institute of International Affairs, March 1947
Ireland (1836) .	..	1·8	102 m	45	46	Poor Law Commissioners' Report
Mediterranean and low rainfall						
Spain . .	192	4·0	21	90 d	19	De Arlandis, *Weltwirtschaftliches Archiv*, Sept. 1936
Spain (1903–12) .	..	..	..	83	..	Vandellos, *Metron*, 1925
Greece . . .	33	1·18 (1946)	36	54	19	*To Vima*, Athens, 7th May 1950
Italy (1952) . .	154	6·3 (1936)	41	46 e	19	*International Financial News*, 22nd May 1953
Spanish Morocco .	..	..	..	over 65 i	low	Fogg, *Sociological Review*, Jan.-April 1940
Russia (1913) .	..	28·8	25	74	18	Marcus, *International Labour Review*, vol. 53, p. 356
Russia (1928) .	..	31·5	28	78	22	*International Labour Review*, vol. 27, p. 349

[*Notes overleaf*

NOTES FOR TABLE XXXV

* Cultivated land as defined by F.A.O., including fallows and orchards. In countries where land is very scarce, it is a reasonable assumption that all land capable of cultivation is being cultivated, and that grazing is confined to mountains, swamps, heath land, etc. But in less crowded countries we must bear in mind that a great deal of land is grazed which would have been capable, physically, of arable farming.

[a] Where result is given in the form of the number of days worked per year, it is assumed that 300 days would represent full utilisation of labour.

[b] Mr. Issawi, however (I.L.O. Asian Advisory Committee Report, January 1949), states that "1½ m. out of the present 2 m. farm families" could cultivate Egypt, without loss of productivity. Each such family now contains on the average, it appears, 1·8 male workers. If Mr. Issawi intended the number of workers per family in his 1½ m. families to be lower than this, his result may be comparable with Dr. Murray's.

[bb] In the Stara-Zagora district this figure rises to 120 (A. Suha, *Economic Problems of Eastern Europe*).

[c] Quoted by Professor Wagemann in Institut für Konjunkturforschung *Weekly Bulletin*, 29th June 1939. These authors estimated that the whole adult female population should also be employed, and thereby show a much lower degree of utilisation, of 62 per cent only.

[d] 7½ per cent complete unemployment and 5 per cent partial among rural workers.

[e] A much higher degree of utilisation is shown by *Foreign Agriculture*, May 1945, which quotes estimates by Vitali and Angelini that the average rural worker worked 2250 and 2500 hours per annum, respectively, as against a supposed norm of 3000.

[f] The same author quotes densities (total population divided by 4) per sq. km. of cultivated land of 50-90 in Dalmatia, Herzegovina, Montenegro and Macedonia: 40-60 in N.E. Slovenia and the Croatian Highlands: 25-40 in Central Croatia and North and Central Bosnia and Serbia: and only 12-17 in the Danubian plain.

[g] Post-1945 Poland is stated (*loc. cit.*) to have 25 per cent less rural population and only 6 per cent less area.

[h] A number of different estimates are reviewed by Rudzinski, *Polish Economist*, July-Sept. 1942, who quotes Poniatowski's low standard of 7½ per sq. km. of total area, which implies only a 40 per cent utilisation of labour. Oberländer's estimate indicates 57 per cent, but Baranowicz's 85 per cent and that of Landau, Panski and Strzelecki 88 per cent.

[i] About half the area of the country is described as being settled at or above a density of 65 men per sq. km. of *total* (not merely cultivated) area.

[j] Provincial boundaries as in 1941, including some of what is now Pakistani territory. From Mr. Tarlok Singh's *Poverty and Social Change*, 1945.

[k] Assuming both jute and rice grown. In areas growing only jute, the figure falls to 30 per cent.

[l] Refers only to the sub-montane area of the province.

[m] There are no official statistics of cultivated area before 1867, when 15,000 sq. km. were cultivated. The figure fell steadily after that date, and it was assumed that 18,000 sq. km. were cultivated in 1836: this is about ¼ of the total area. A comparable series showing the numbers engaged in agriculture between 1841 and 1881 is given by Booth, *Journal of the Royal Statistical Society*, 1886, p. 339, and can be linked to the more recent Census figures. But, even when the country was most densely populated, in the 1840s, the ratio of cultivated land to total area was still low. The social organisation of the country was such that a great deal of Ireland, even then, was given over to grazing, leading to the ghastly paradox that, even at the height of the famine in 1845, dairy products were being exported from the country. A series of carefully compiled official estimates of the proportion of the year for which an Irish rural labourer could expect to find employment were published by Sir Arthur Bowley (*Journal of the Royal Statistical Society*, 1899, p. 401).

	Numbers Occupied in Agriculture (millions)	Numbers Occupied in Agriculture per Sq. Km. of Total Area
1801	1·17 *	14
1821	1·53 *	18
1831	1·75 *	21
1841	1·84	22
1851	1·43	17
1861	1·18	14
1871	1·06	13
1881	0·99	12
1901	0·87	10

	Percentage of Year Worked
1777	100
1800	80
1829	60
1837–50	50
1862	60
1870	67
1880	77
1886	89
1893	100

* Extrapolated back from 1841 on numbers of total population.

who could be fully occupied on a square kilometre of cultivated land as follows: Sind, 12; Bombay, 13; Punjab, Central Provinces and North-West Frontier Province, 21; Madras, 25; United Provinces, Bihar and Orissa, and Assam, 31; Bengal, 35.

The low figure for Sind (now part of Pakistan) is difficult to sustain. The land had only recently been irrigated at the time of Mr. Tarlok Singh's investigation, and had not yet been fully settled. The water supply also tended to be inadequate and uncertain, and men were often occupying farms rather larger than they actually cultivated.

The agreement between the two methods, for provinces for which both figures are available, is very good, except for the Punjab. The Punjab is an irrigated area, chronically short of water. Officials both in the Punjab and in the North-West Frontier Province (now part of Pakistan) have estimated that on land where sufficient water was available to take two crops per year, men working at a density of 40 per square kilometre of cultivated land could be fully occupied. The International Labour Office Advisory Committee for Asia, however, estimated a lower figure, of 29 men, for irrigated areas in Pakistan, also assuming double cropping. (In the latter case it was specified that 2 pairs of bullocks would be needed to every three men.) Mr. Tarlok Singh's figure for Bengal is very close to that computed theoretically for a rice-growing area. Bombay is the most economically developed region of India, and the availability of industrial employment has raised wages and reduced " disguised unemployment ". Under these circumstances, some of the more laborious agricultural methods practised elsewhere in India may have been discarded.

In Java,[1] of a total area of 133,000 square kilometres, 60 per cent is occupied by rice cultivation, 8 per cent by estate agriculture, 23 per cent by State forest (mountainous regions) and the remaining 9 per cent by roads, buildings, etc. This implies a density of about 110 men per square

[1] Population Index, July 1940.

kilometre of cultivated land, a figure which obviously involves a great deal of under-utilisation of labour. Dr. de Vries, of the International Bank, who knows Java well, has pointed out (private communication) that between 1880 and 1940 the population of Java rose 2·4-fold, so that the density of population at the earlier date would have represented a normal full density for a rice-growing country. Over this period of sixty years, however, agricultural production rose in the same proportion as population. Dr. de Vries has ventured to speculate that there may be some economic relationship connecting the two, in the sense that, if the rate of growth in food production either exceeded or fell short of the rate of growth of population to any great extent, the consequence would inevitably be, in a community almost entirely lacking what we should regard as normal marketing and transport facilities, violent price fluctuations, disrupting the whole social economy.

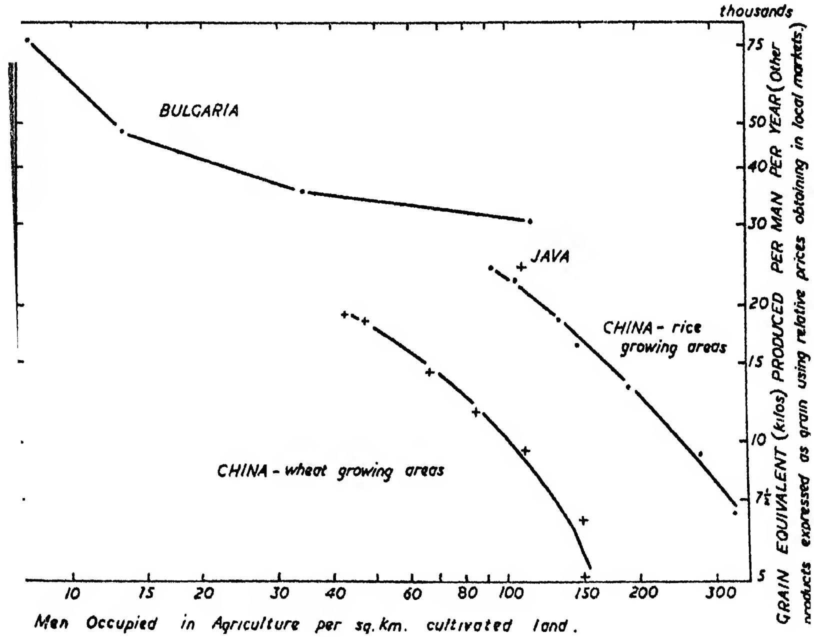
We need not, however, remain entirely in the dark as to what happens when what are regarded as the normal limits of density are exceeded. A very interesting comparative study can be made, using the above figures for Java, together with Dr. de Vries's estimate of output expressed in rice equivalents; Professor Buck's figures for farms of varying size in China; and some interesting figures compiled from the Bulgarian agricultural census of 1926.[1]

This diagram brings out some very interesting points. In an Oriental country, rice culture, at a given density of settlement, is a good deal more productive than wheat culture; and Javanese rice culture is no more productive than Chinese, at a given density of settlement. Eastern European wheat and maize growing is, however, a good deal more productive than Chinese at the same density of settlement; and densely settled areas in western

[1] Dolinski, *Zeitschrift für Nationalokonomie*, 1933, p. 115. For each class of farm it was assumed that (1) the annual output of livestock products was one-third of the value of the livestock shown in the census, (2) of those shown as family workers, half were male.

Europe such as Netherlands, Denmark and Belgium, are of course, far more productive than eastern Europear areas settled at the same density.

Although Ceylon has considerable areas of unused land the inhabited part of the country is densely populated with a climate similar to that of Java. The area devotec to rice is, however, small, and the yield obtained poor Ceylonese agriculture is mainly for export crops. I is



interesting, however, to show the average number of m occupied per square kilometre, the expected returns I worker, and their equivalent in rice. At present-day pric tea is comparatively remunerative and rubber is not, l at any rate the general trend of the returns is similar that found in China. The growing of coco-nuts involves high capital investment per man engaged.

The League of Nations Conference on European Ru Life in 1939 concluded that a total rural population

70 per square kilometre (i.e. about $17\frac{1}{2}$ males at work per square kilometre) was excessive in Lithuania, but that 70 persons *at work* per square kilometre (probably representing about 50 males at work) was not seriously excessive in East Flanders. An adequate system of transport and communication (they might also have added, an abundant supply of fertilisers) makes all the difference. Thus we can perfectly well contemplate any region in the world, which has adequate rainfall and sunlight, being eventually cultivated by a farm population as dense as that which prevails in the most densely settled regions of western Europe.

TABLE XXXVI

	Men Occupied per Sq. Km.	Return per Man Engaged per Year		Planting Costs per Man Engaged, rupees
		Kilos of Crop	Kilos of Rice Equivalent	
Rubber .	125	400	1320	4,000
Coco-nuts .	25	1900 (copra)	240	10,000
Tea . .	250	250	1870	4,000

Source.—Data privately communicated by Ceylon Department of Agriculture, except for rice equivalent, calculated from 1953 world prices.

If, on the other hand, we decide to neglect our obvious duty, and do nothing to help the hungry countries obtain the transport, communications and fertilisers which they require, we can see what will happen. The law of diminishing returns per man, as densities increase, takes its gradual course as we go down the scale through Bulgarian farms of different size. But once we reach the Chinese level of density, the line becomes a curve. We are faced with accelerated diminishing returns. The worst figure of all, for the smallest farms in Northern China, giving a density of 150 per square kilometre and a product per man of only 500 kg. of grain, should be seen against the background that the food requirements of a purely grain-eating people in that climate are 200 kg. per year per head of the

population, man, woman and child, in addition to which a certain minimum of other foods (vegetables, etc.) is required. The labour of one man fully at work on such a farm will barely suffice to feed two people. This is, in truth, the very limit of subsistence.

CHAPTER VI

THE PRODUCTIVITY OF MANUFACTURING INDUSTRY

MANUFACTURE can be precisely defined as the continuous transformation, on a large scale, of raw materials into transportable products. The operative word *continuous* excludes such processes as hand tailoring, shoe repairing and the like: similarly the word *transportable* excludes all processes of building, construction and installation, which are more conveniently classified with the service industries. It is indeed the *continuousness* of the process and the *transportability* of the product which give manufacture its essential nature, of concentrating at one point the production of goods which will eventually be consumed over a considerable area, and thereby of subdividing and rendering more economic the process of production.

The traditional method of measuring the extent of manufacturing industry was to record that figure known as "net output" in U.K. and as "value added" in U.S.A.; defined as the value of the products (at works, exclusive of any transport or selling expenses which may later be incurred on them) less the cost of *materials and fuel* which have been used up in their production (these latter also reckoned at works, and therefore *inclusive* of transport and selling expenses which have been incurred on them).

In this way certain *material* costs only have been deducted, and no non-material costs. To show the true contribution of manufacture to the net national product we must deduct another material cost, namely depreciation and maintenance of buildings and equipment; and non-material costs for accountancy, postage, advertising, and a whole host of other services which a modern business has to purchase. It is also customary to exclude at

this stage excises[1] and similar taxes levied on the product, on the grounds that, if these taxes were absent, the price of the product would be *pro tanto* lower to about the same extent. Direct taxes, however, are not excluded. Net income produced by manufacture therefore represents the sum of the wages, salaries, rents (net of depreciation of buildings), interest and net profits (after depreciation but before direct taxation) of all those engaged therein.

We are now coming to realise that "net output" or "value added" was one of the somewhat materialistic concepts to which a previous generation was addicted, and that "net income produced" is the useful concept. Is there any valid reason why we should debit an industry for the goods, but not for the services, which it purchases? The distinction is seen to be more illogical still when we realise that the purchases of raw material and fuel do in fact contain an element of services, of the transport and merchanting charges incorporated in their value: while we refuse to debit the cost of services which the manufacturer has to purchase directly.

As, however, so much, at any rate of the older statistical information, is only available in "value added" form, it is necessary to assemble data to enable us to estimate "net income produced" from "value added".

For the United States, we are confronted with three different definitions of "income produced", though that of the Department of Commerce now holds the field. That of the National Industrial Conference Board was probably too low for the years before 1919.

The ratio between "income produced" and "value added" shows considerable fluctuation. Naturally it is lowest in a year like 1933, when output is very low and fixed charges for depreciation (on equipment purchased in earlier years at a price above that currently prevailing) and other fixed expenses represent a high proportion of all "value added". For reasons which are precisely the converse of these, the ratio is high in 1951.

[1] Treating subsidies as negative excises.

In U.K., "value added" in 1935 was £1182 millions, or £1300 millions if we include small firms. (Mining and building have been excluded.) The total of "wear and tear allowances" against taxation in 1934–35 was £105 millions. This will include some allowances to transport, mining, etc.; but on the other hand some addition must be made for depreciation on industrial buildings. Altogether, we can probably take depreciation in manufacture

TABLE I

INCOME PRODUCED AS PERCENTAGE OF "VALUE ADDED"

	National Industrial Conference Board	Professor Kuznetz	Department of Commerce
1899	58·1	..	..
1904	58·4	..	..
1909	59·0	..	..
1914	65·0	..	..
1919	60·5	75·5	..
1921	68·1	69·8	..
1923	62·2	72·6	..
1925	60·0	69·8	..
1927	61·9	69·5	..
1929	59·0	67·3	71·8
1931	66·5	64·0	66·9
1933	60·2	54·4	54·0
1935	63·2	69·0	72·0
1937	66·1	72·0	76·8
1939	..	..	72·7
1947	..	..	80·0
1949	..	..	84·0
1950	..	..	83·0
1951	..	..	87·0

at about 7 per cent of "value added". (It appears to have been only 3 per cent in 1907, but had risen to nearly 5 per cent by 1913.) Other deductions, for purchases of services, appear from the White Paper to have been, in 1950, about 16½ per cent of "value added". In 1907 and 1924, judging from information published in the Balfour Report, these costs were only about 10 per cent.

For South Africa, the ratio of "income produced" to "value added" was about 75 per cent throughout the period 1917–43. In New Zealand the ratio was about 75 per cent in the 1920s, fell to a minimum of 67 per cent during the depression, and is now about 78 per cent. For Canada, current official figures are not readily available, but Professor MacGregor[1] has made the following estimates :

TABLE II

	1917	1929	1933	1936
Percentages of "value added" (after deducting repairs and maintenance) :				
Depreciation	5·9	7·1	9·4	7·8
Other deductions	6·1	13·1	17·3	14·7

Here also the rise in "other deductions" (purchase of services) is noticeable. In Chile,[2] where the manufacturing economy is fairly simple, depreciation has been found to be 7·5 per cent of value added and "miscellaneous costs" and insurance 9·7 per cent.

The year-by-year fluctuations in the United States and elsewhere largely represent differences in the ratio between money values of output and of depreciation. If measures were available in real terms, we should probably find a much greater constancy. In all, we will assume a ratio of 75 per cent. Services and depreciation may have represented a somewhat smaller proportion of "value added" in the earlier years, and the use of a constant proportion will therefore impart some downward bias to time series. There is, however, a tendency for time series of output in countries in earlier stages of industrialisation to acquire an upward bias (when goods formerly produced by handicraftsmen, and excluded from the statistics, are first produced by factories and included in the statistics)

[1] *Review of Economic Statistics*, May 1945.
[2] *U.N. Economic Survey of Latin America.*

and we may assume that these two factors roughly offset each other.

About all the available statistics indicating the real volume of manufacturing production throughout the world between 1870 and 1938 have been assembled by Mr. Folke Hilgerdt in the League of Nations publication *Industrialisation and Foreign Trade* (1945). Mr. Hilgerdt has selected the best available indexes showing changes in the volume of production in each country since 1870. He has also given, in the form of a " schedule of weights ", the best estimate which can be made of the comparative volume of manufacturing production in all countries. This was originally based on a schedule used by the League of Nations in *World Production and Prices, 1935–36*, which used as sources each country's published figures of net value of industrial production, supplemented by estimates where official figures were not published, " on the basis of detailed comparisons between their statistics for quantity of output and number of workers in their different industries and those of reasonably comparable countries ". Mr. Hilgerdt has made further adjustments to the original figures in the light of subsequent information, but also to take account of the fact that, particularly in high-tariff countries, recorded production values do not always reflect the relative real volume of manufacturing production. We can thus prepare world tables for the volume of manufacturing output on a " value added " basis, transformed to a net income basis by deducting 25 per cent.

To convert the base to I.U., we use the Department of Commerce estimate that the income produced in manufacture in 1929 was \$22·0 billions at current prices, equivalent to 20·25 billion I.U. (adjusted on average price of manufactured goods in 1925–34 as compared with 1929). Real production in 1925–29 (comparing the average index of industrial production over this period with that of 1929) may be expressed as 18·0 billion I.U., and this figure is used as a base for all pre-1939 data which follow.

A much more detailed and precise comparison [1] of real volume of net output in U.S.A., Britain and Germany gives a most striking confirmation of Mr. Hilgerdt's results.

For Britain, up to 1924, Mr. Hilgerdt uses the index of Dr. Hoffmann, which is based on a limited number of commodities and does not appear entirely satisfactory for bridging the gap between 1907 and 1930, a period of greatly changing conditions. In Britain more than in most other countries we have, per unit of net output, a large volume of imported raw materials, subject to violent price changes which may differ greatly from the price

TABLE III

Country	Numbers Covered by Census of Manufacture, millions	Comparative Output per Head,* U.S.A. =1	Product of Two Previous Columns	Income Produced in Millions of I.U. (based on U.S.)	Do., calculated from Mr. Hilgerdt's Data
U.S.A., 1937 .	9·8	1	9·8	20,850	..
Britain, 1935 .	5·2	$\sqrt{\frac{1}{2{\cdot}38} \times \frac{1}{2{\cdot}29}} = {\cdot}428$	2·226	4,730	4750
Germany, 1936	6·0	$\sqrt{\frac{1{\cdot}01}{2{\cdot}31} \times \frac{1{\cdot}04}{2{\cdot}29}} = {\cdot}446$	2·676	5,690	5720

* From geometric mean of results obtained by weighting with the net outputs of the two countries compared.

changes of the finished product. Also there was, over this period, a great decline in the relative importance of the textile trades, which consumed an unusually large volume of raw materials. These considerations justify a more detailed examination of the British position.

Between 1907 and 1924 the real volume of finished goods produced by industries within the scope of the Census of Production was found, by a careful inquiry [2] using all available data, to have risen 30·9 per cent on 1907 weights or 16·5 per cent on 1924 weights, with a

[1] L. Rostas, *Economic Journal*, April 1943.

[2] Professor P. H. Douglas and N. A. Tolles, *Journal of Political Economy*, February 1930.

geometric mean rise of 23·5 per cent. To allow for excluded small firms, the 1907 output [1] should be raised by about 7·3 per cent and the 1924 output by 2·1 per cent, making the true increase 17·5 per cent. Exclusion of mining and building would raise this figure to about 22 per cent.

Between 1924 and 1930 the real volume of output of firms employing ten or more workers rose by 8·1 per cent.[2] To include all small firms the 1924 figures should be raised by 7·7 per cent and the 1930 figures by 8·9 per cent,[3] making the true increase 9·4 per cent. Exclusion of mining and building raises this to 10·0 per cent (increase in building and decrease in mining were of approximately similar orders of magnitude).

The true final product of industry, excluding all duplication, consists of the value added in manufacture, plus the cost of original unmanufactured materials obtained from primary production or importation, plus transport and merchanting charges on materials and on semi-finished manufactures. These values were estimated for Census years and the cost of materials in 1907 and 1924 can be re-expressed at 1930 prices by use of the Sauerbeck index number. (An allowance should be made for transport and merchanting rather larger than is given in the above sources.) At 1930 prices this indicates a consumption of materials of £581 millions in 1907, £606 millions in 1924 and £647 millions in 1930. When we separate mining and building from manufacture, however, we must increase these figures by the amount of coal and other minerals consumed by manufacture, and reduce that by the amount

[1] Flux, *Journal of the Royal Statistical Society*, 1929, Part II, p. 37.

[2] Final Report of the 1930 Census of Production.

[3] Firms employing under ten workers were exempt from the obligation to supply returns in the 1930 Census but were nominally covered in the Censuses of 1907 and 1924. The following table gives the figures of the allowances made for exclusion of these small firms:

Year	Net Output, £ million	Employment, thousands
1907	50·0	500
1924, Returning	85·1	473
,, Not returning	35·9	207
1930	134·0	758

of imported materials consumed by mining and building, representing net additions of approximately £70 millions, £70 millions, and £60 millions, at 1930 prices, for the three years respectively. Net output in 1930, excluding mining and building, and including all small firms, was £1359 millions, and final product can be put at £2066 millions. This is taken as a basis for estimating the real volume of final product in 1924 and 1907, and by deducting the real volume of materials we can deduce "real value added" in each year.

TABLE IV

Item	£ million at 1930 Prices		
	1930	1924	1907
Final product .	2066	1878	1539
Materials used .	707	676	651
Value added .	1359	1202	888

On Mr. Hilgerdt's base, the net income produced by British manufacture was 4020 million I.U. in the base period 1925–29, and exactly the same in the year 1930. Calculations from this base have already been checked against Mr. Rostas's calculations, and we will therefore take 4020 million I.U. in 1930 as a base for all subsequent years.

The index numbers used by Mr. Hilgerdt indicate a rise between 1924 and 1930 of only 4 per cent as against the 13 per cent indicated above. (During this period the heavy and textile industries were rapidly declining in relative importance.) This adjustment is distributed linearly between 1924 and 1930.

For 1913 and all earlier years, income in 1907 at 2625 million I.U. is taken as base.

For Soviet Russia Mr. Hilgerdt uses the official values of production at 1926–27 prices, but this index has a strong upward bias (owing to the very high 1926–27 prices of certain articles whose production subsequently expanded rapidly).

An alternative index has been calculated from all available output data, weighting according to U.S. prices.

1913	318	1931	435
1921	25	1932	446
1922	54	1933	496
1923	88	1934	597
1924	126	1935	663
1925	218	1936	985
1926	288	1937	1068
1927	337	1938	1062
1928	361	1939	(1110)
1929	415	1940	(1160)
1930	439		

To link this series to I.U. we have Professor Prokopovicz's series[1] of the net contribution of manufacture (other than handicraft) to the national income and Czechowicz's comparisons[2] of Russian and American prices of manufactured goods.

TABLE V

Year	Net Income from Manufacture, million roubles	Do., $ million at Par of Exchange	Russian Prices compared with Current U.S. Prices of Manufacture	Do., compared with U.S. 1925-34 Prices	Value of Net Income from Russian Manufacture, million I.U.	Do., as Multiple of above Index
1913	2399	1237	1·69	1·35	916	2·88
1924	1858	956	2·44	2·71	352	2·79
1925	2686	1385	2·38	2·76	502	2·30
1926	3959	2040	2·56	2·96	689	2·35
1927	4571	2358	2·50	2·74	861	2·55
1928	5252	2706	2·32	2·57	1053	2·91

The above data, therefore, are used for 1913 and 1924–28. For years before 1913, Mr. Hilgerdt's series is used with the above 1913 value as base. For later years the index figures are used multiplied by a factor of 2·9

For Germany also a more refined comparison is available between 1928 and 1936.

[1] Birmingham University, Bureau of Research in Slavonic Studies, 1931.
[2] *Weltwirtschaftliches Archiv*, April 1932.

A careful estimate of gross and net output in 1928 was made in the course of the general inquiry into industrial production of that year.[1] Figures for gross and net industrial output for 1936 have also been calculated.[2] In the following table gross output is revalued by means of the index figure of prices of finished goods, and materials by the index figure of basic industrial products. Net output is obtained by difference. The figures include "hand work" or craftsmen's output as well as that of factories.

TABLE VI

Item	Milliard Marks		
	1936	1928	1936, Revalued at 1928 Prices
Gross output . .	67·5	84·0	88·3
Basic materials . .	35·0	50·5	50·0
Net output . . .	32·5	33·5	38·3

Real gross output appears to have increased by 5 per cent as against the 7 per cent indicated by the index number of production. But "Real Net Production" appears to have increased by 14 per cent. In this case the discrepancy is clearly due to the use of a smaller volume of basic materials per unit of output.

Dr. Hoffmann's indexes have been adjusted accordingly for the period 1935–38.

In Table VII estimates of net income produced are extrapolated, by means of index numbers of production, from Mr. Hilgerdt's base in 1925–29; and from certain other base years. Each such base is marked with an asterisk. A base can be established for any year for which there appears to be a reasonably comprehensive census of manufacturing production. The conversion of the national currency to I.U. is effected by means of the general conversion factors given in Chapter III. These will introduce some error, in so far as they represent prices of primary products and of services, as well as of

[1] Figures from *Konjunktur-Statistisches Handbuch.*
[2] Institut für Konjunkturforschung *Bulletin,* 6th October 1937.

[*contd. on p.* 338

TABLE VIII

I.U. of Net Income Produced per

	1953	1952	1951	1950	1949	1948	1935–38	1930–34
Belgium [a]	..	0·404	0·406	0·381	0·372	0·349	0·406 [b]	..
Denmark	0·566	0·561	0·556	0·575	0·556	0·532	0·648	·620 [c]
Finland	0·492	0·469	0·466	0·438	0·402	0·383	0·408	·385
France [e]	0·337	0·342	0·324	0·296	0·304	0·277	0·305	·253
Germany [f]	0·503	0·465	0·423	0·395	0·359	..	0·413	·397
Greece [a]	..	..	..	..	0·248	0·235	..	·191 [g]
Hungary	..	..	..	..	..	..	0·256	..
Iceland	..	..	..	0·532 [h]	..	..	..	..
Ireland	..	..	0·524	0·536	0·525	0·494	0·482 [i]	..
Italy	..	..	..	..	..	..	0·209 [j]	..
Netherlands [k]	..	0·493	0·483	0·459	0·438	0·407	0·516	·377
Norway [l]	0·574	0·555	0·548	0·497	0·499	0·497	0·509	·491
Poland	..	..	..	..	..	..	0·317	·291
Portugal	..	..	..	0·138 [m]	..	..	..	..
Roumania [n]	..	..	..	..	..	..	0·233	·325
Saar [a]	..	..	0·511	0·435	0·475	..	..	..
Sweden [o]	0·945	0·909	0·897	0·879	0·853	0·820	0·675	·585
United Kingdom	0·421	0·409	0·412	0·412	0·395	0·377	0·344 [p]	·327 [p]
Yugoslavia	..	..	..	..	..	..	0·173 [q]	..
U.S.S.R.	..	..	..	..	..	..	0·207	·130
U.S.A.	1·493	1·429	1·372	1·404	1·316	1·308	1·029	·911
Canada	1·287	1·243	1·228	1·231	1·157	1·146	0·821	·710
Australia [u]	..	..	0·621	0·594	0·587	0·582	0·416	·428
New Zealand	..	..	..	0·806	0·808	0·793	0·793	·642
South Africa [w]	..	..	..	0·490	0·475	0·475	0·321	..
Japan	0·362	0·321	0·295	0·236	0·247	0·172	0·286	·289
India [x]	..	..	0·188	0·174	0·170	0·171	0·161	..
Mozambique [cc]	..	..	0·117	0·096	..	0·067	..	..
Southern Rhodesia [a]	..	..	0·294	0·289	0·269	0·252	0·214 [bb]	..
Costa Rica [a]	..	..	..	0·195	..	..	..	..
Dominican Republic [a]	..	0·143	0·144	0·147	0·138	0·142	0·104 [y]	..
Mexico [aa]	..	0·576	0·633	0·593	0·541	0·486	..	..
Puerto Rico [n]	..	..	..	..	0·323	..	0·371 [z]	..
Argentine [a]	..	0·315	0·326	0·317	0·306	0·312	0·344 [v]	..
Brazil [dd]	..	..	0·637	..	..	0·547	..	..
Chile [a]	..	..	..	0·403	0·405	0·401	0·568 [bb]	..
Peru [a]	..	..	..	0·741	..	..	..	..
Colombia [a]	..	..	..	..	..	0·138 [ee]	..	..
Uruguay [a] [ff]	..	..	0·197	..	..	..	0·272 [gg]	..
Venezuela [a]	..	..	..	..	..	..	0·348 [gg]	..
Israel	..	..	..	0·346	..	..	..	..
Philippines [a]	..	..	..	..	..	0·300	..	..
Turkey [a]	..	..	..	0·416	..	..	0·423	·427 [hh]

[a] Data on hours not available; assumed 2400 hours per year.

[b] Extrapolated back from post-war data on index given in Economic Commission for Europe Survey for 1950.

[c] 1931–34 only.

[d] These figures refer to 1926 and 1911 respectively and are based on an estimate by Professor Cohn (*Politiken*, 29th September 1950). He estimates net output per manufacturing worker in 1948 at 12,500 kr., and estimates net output for other years in currency of 1948 purchasing power. These figures are obtained by extrapolation from 0·532 I.U. per man-hour in 1948. On Professor Cohn's reckoning, net output per man-hour in 1939 was only slightly higher than in 1926.

[e] The figures of labour in manufacture are based on the year 1930, for which year M. Dugé de Bernonville made an estimate repairing the imperfections of the official *Enquête industrielle*. This report also makes estimates of the labour force in 1861–65 and 1841–45. To allow for salaried earners and working proprietors, an addition of 20 per cent is made since 1948, and of 25 per cent in earlier years. The figures for 1913 to 1938 are deduced (taking 0·246 in 1930 as a base) from M. Magron's series *Évolution de la productivité du travail dans l'industrie française de 1913 à 1948*, Commissariat Général du Plan, September 1948.

On this same base, the figure for 1861–65 is 0·070, and for 1841–45 only 0·034 — almost an Oriental standard of productivity.

[f] W. Germany only after 1938. Earlier data extrapolated back from a base of 0·366 in 1929, on information given in the *Bulletin* of the Institut für Konjunkturforschung, 28th November 1934.

[g] 1930.

[h] Estimated 2200 hours.

[i] 1937 and 1929 respectively.

[j] 1937–39.

[k] Labour force estimates based on census of manufacture figure of 1 million in 1950, with a 5 per cent addition for working proprietors.

Man-Hour in Manufacturing

1925–29	1920–24	1913	1905–9	1900–4	1889–90	1879–80	1869–70	1859	1840
..	..	..	..	..	..	..	..	..	..
·512 [d]	..	·376 [d]	..	..	..	..	..	..	..
·319	·220	·209	..	..	..	..	..	..	..
·235	·180	·180	..	..	..	..	..	..	..
·339	..	·320	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·274	·233	·261	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·298 [i]	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·305	..	..	..	..	..	..	..	..	..
·470 [m]	..	..	..	..	..	..	..	..	..
·232	..	·167	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·228	·158	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·484	·418	..	..	..	..	..	..	..	..
..	·293 [p]	·177 [p]	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
·156	·052	·124	..	..	..	..	..	..	..
·760	·622	·445 [r]	·121	·387	·292	·271	·231	·266 [s]	·185 [s]
·679	·586	·356 [t]	..	·220 [t]	·169	·132	·116	..	..
·433	·333	·277 [r]	·227	..	..	..	..	..	..
·661	·618	·647 [r]	·568	..	..	..	..	..	..
·343	·282	·208 [v]	..	..	..	..	..	..	..
·236	·172	·137	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
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..	..	..	..	..	..	..	..	..	..
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..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..

[i] Labour force has been increased by 10 per cent to allow for working proprietors and excluded small firms.

[m] 1927–29 only.

[n] Assumed 2700 hours per year.

[o] Post-war hours assumed 2700 per year.

[p] These four data refer to the census of production years 1935, 1930, 1924 and 1907 respectively. The figure in 1938 may be estimated at 0·375.

The data given in the census of production reports were adjusted to include N. Ireland in 1948 and to complete the coverage in 1950. The data for 1935 and earlier years were raised by 4·2 per cent to adjust to the modern definition. The data for the earlier censuses of production were published in the *Statistical Abstract* for 1946.

[q] 1938. Labour force data from Bicanic, *Geographical Review*, January 1944.

[r] 1910–13.

[s] Extrapolated back from 1869 on estimates made by Dr. King.

[t] 1910 and 1900 respectively.

[u] Since 1948, year commencing 1st July of date indicated. Since 1949, labour force figures increased by 3000 to allow for working proprietors.

[v] 1911.

[w] Since 1948, year ending 30th June of date indicated.

[x] Assumed 3000 hours per year. Including Pakistan 1935–38.

[y] 1937.

[z] 1939.

[aa] Assumed 2300 hours per year.

[bb] 1938.

[cc] Assumed 3000 hours per year.

[dd] Assumed 2400 hours per year. Records refer only to manufacture in provincial capitals and are raised by 20 per cent.

[ee] 1944–45.

[ff] 15 per cent addition for salaried workers.

[gg] 1936.

[hh] 1932–34.

manufactures; but no satisfactory alternative appears to be at present available.

Our next object is to re-state as many of these products as possible in the form of figures of net income produced per man-hour of work done. This involves obtaining data of both employment and man-hours. The employment data have to be obtained from censuses of manufacturing production and to be on a comparable definition with the production data. The numbers shown by the Census of Population as engaged in manufacture cannot be used. Even in the most economically advanced countries these latter figures always include a substantial number of those who would be regarded, for statistical purposes, as handicraftsmen and not engaged in manufacture (dressmakers, shoe repairers, upholsterers and the like). Precise figures for working hours in manufacture in most countries are now available and are collected by the International Labour Office. Where these are not available, some assumptions have to be made as indicated in footnotes. For a number of countries the International Labour Office now has an index of year by year changes in the aggregate number of man-hours worked in manufacture, and this is used wherever possible to extrapolate figures from a base date, generally 1948 (Table VIII).

An alternative set of data for 1950 are available from an estimate prepared by the Stanford Research Institute, who have made their own estimates of the purchasing power of each currency on the basis of the prices of industrial goods alone. Taking productivity per man-hour in the U.S.A. at 100, they obtained the following figures for other countries:

Belgium	34	Netherlands	34
Canada	78	Norway	37
Denmark	37	Saar	31
France	30	Spain	15
Germany	32	Sweden	49
Italy	20	United Kingdom	45

Even if the precision of some of these figures is very unsatisfactory, the differences in their orders of magnitude,

and rates of growth, are clearly established. Before we attempt to generalise, however, we should examine some data about the rates of progress in individual industries.

We may open with a remarkably systematic review of the comparative labour requirements of hand and machine processes in producing a great variety of articles which was made by C. D. Wright, U.S. Commissioner of Labour, in 1898. Even at that date records of the labour cost of hand production could only be obtained from a few businesses operating in remote districts or from old documents; and the Commissioner says, if the work had been postponed for a few more years "the information would no longer have been available".

Wright's study brings out the important fact that the saving of labour to be obtained by mechanising hand processes (with the best machinery available in 1898) varied greatly from industry to industry. In some only 50 per cent of the labour was saved, in others as much as 98 per cent.

The comparison covers only direct labour costs, and takes no account of the maintenance, depreciation, administration, fuel and similar costs which offset a large part of the direct gains from mechanisation. The figures refer to labour cost at given wage rates, not to man hours, i.e. they allow for any use of more costly types of labour necessitated by the introduction of machinery. Where pre-1865 wage data were used, the figures were doubled to allow approximately for the change in wage rates.

Though the relative order of industries in Wright's list has been somewhat changed by mechanical discoveries since 1898, it remains a useful guide. Industries near the head of the list have generally been, in fact, those which it first proved remunerative to mechanise (except for trades like furniture and jewellery, where the consumer generally has a specific preference for hand-made goods).

Comment upon Wright's results was made by Levasseur in his *Comparaison de travail à la main et à la machine* (Paris, 1900), who also quotes a ratio of 0·03 for glass-polishing, and gives an interesting comparison for the

shirt trade. In 1848 shirts were made entirely by hand at a labour cost of 1·01 man-days. In 1900 a working shirt could be made for 0·13 man-day of machine labour plus 0·04 man-day of hand labour, but a better quality shirt, " s'adressant à la petite bourgeoisie ou au dimanche

TABLE IX

Industry	Ratio of Direct Labour Cost by Machine Process to that of Hand Process (Median of Products)	Number of Products Studied
Nails and spikes	·02	10
Cotton	·035	10
Jewellery	·08	15
Woodwork	·08	34
Tools	·09	14
Bookbinding and stationery	·10	13
Hosiery	·11	16
Furniture	·12	39
Boots and shoes*	·13	7
Printing	·15	20
Transport	·15	9
Box-making	·20	15
Cutlery	·21	13
Carpets	·26	10
Tobacco	·28	10
Mining	·28	2
Stonework	·29	22
Quarrying	·31	8
Agriculture	·32	27
Baking	·35	13
Preserved food	·40	16
Brooms and brushes	·52	13
Haberdashery	·54	11

* A survey of the number of man-hours needed for the production of 2000 pairs of men's shoes, assuming perfect balance of work in the factory (*Monthly Labour Review*, February 1939), shows, for the period since 1850:

1850	31,020	1923	2,124
1900	3,402	1936	1,870

In the production of women's shoes, on the other hand, there has been no increase in output per labour-hour in the last ten years, though they shared in the great improvements before 1900.

de l'ouvrier ", involved 0·07 man-day of machine labour and 0·51 of hand labour. Wages were 2·5 francs a day for the machinists and 1·5 francs for hand workers in factories. But most of the hand work, including buttonholing, was done in homes at 1 franc per day or less.

Some long-period comparisons for France are also made by Professor Fourastié,[1] who uses the device of measuring the hourly wage of unskilled urban labour at various dates, and then expressing the prices of various products in terms of their equivalent in man-hours of unskilled labour. Between 1910 and 1937–39 labour requirements had fallen by 70 per cent in the production of bricks, 60 per cent in the production of cycles and photographic equipment, 50 per cent in the production of hand tools, 35 per cent in the production of men's suits and of toothbrushes. He re-states Levasseur's outstanding result in the case of glass mirrors, where the cost in man-hours in 1891 was only 2 per cent of what it had been in the eighteenth century; and adds that by 1949 it was only 0·7 per cent. On the other hand, the man-hour cost of tapestry, as might be expected, is the same now as it was then; and the man-hour cost of a haircut is now $2\frac{1}{2}$ times greater than it was in 1891 (possibly due to greater overhead costs, or to monopolistic organisation of the trade). The man-hour cost of bicycles was falling even more rapidly before 1910; between 1891 and 1913 78 per cent of their man-hour cost was saved.

Professor Sauvy, in *Richesse et population*, estimated that real product per man-hour in the French textile and clothing industry more than doubled between 1896 and 1936. The volume of output only rose 12 per cent and therefore the labour requirements were greatly reduced. The greater part of the increase in real product per man-hour came after 1921.

It is the substantial and rapid economies in labour costs which can be effected by mechanisation in the textile industries, and also the comparatively moderate

[1] In his book *Prix de Vente et Prix de Revient*, Éditions Domat-Montchrétien, and in a report to the Commissariat Général du Plan, 15th March 1950.

degree of skill required for most textile industries (as compared with, say, the metal industries), that causes them so often to be the first choice in the progress of industrialisation of hitherto undeveloped countries. This is brought out fairly clearly by the following table:

TABLE X

PERCENTAGE CONTRIBUTIONS BY DIFFERENT INDUSTRIES TO TOTAL "VALUE ADDED" IN MANUFACTURE

	U.S.A.		Sweden		Britain		Germany	Italy
	1939	1899	1947	1913	1935	1907	1928	1938
Food, drink and tobacco	15·8	19·8	21·5	26·1	17·1	13·5	12·7	22·2
Textiles	7·3	8·7	10·4*	9·5*	13·6	17·6	9·8	15·9
Metal, engineering and vehicles	30·4	31·2	32·6	26·7	33·3	27·0	29·5	33·0
Wood and furniture	5·0	10·4	7·1	11·9	2·8	3·4	6·0	3·1
Paper and printing	10·6	8·4	12·3	10·5	9·5	6·1	7·5	4·2
Chemicals and petroleum products	10·3	4·2	5·2	4·4	7·6	5·2	4·9	9·8
Clay stone and glass	3·7	4·3	3·3	4·2	4·6	3·1	6·0	3·0
Clothing	5·6	9·7	..	..	6·7	8·8	7·5	4·2
Other trades	11·3	3·3	7·6	6·7	5·8	15·3	10·1	4·2

	Japan		Argentine	Venezuela	Brazil	Hungary	Poland	India	China
	1948	1934	1941	1936	1942	1934	1910	1947	1930
Food, drink and tobacco	12·0	11·2	25·3	17·5	39·0	28·4	19·3	20·7	17·1
Textiles	14·7	33·8	17·0	43·5*	19·5	20·8	42·6	34·1	46·6
Metal, engineering and vehicles	36·4	28·3	22·1	1·1	9·7	21·8	13·8	23·7	2·6
Wood and furniture	6·6	2·4	5·8	..	..	2·4	..	3·3‡	..
Paper and printing	2·7†	2·2†	9·4	1·6	..	6·0	..	2·5	..
Chemicals and petroleum products	18·1	15·8	4·7	17·2	7·7	9·8	3·7	4·6	16·2
Clay stone and glass	4·0	2·7	4·1	..	..	5·2	3·8	..	..
Clothing	..	..	..	..	..	2·0	6·0	..	0·5
Other trades	..	..	11·6	..	..	3·6	..	11·0	..

* Include clothing. † Printing only. ‡ Includes stone and glass.

For a long time it has been generally believed by economists that the operations of manufacturing industry

are carried on under conditions of (in the long period) Increasing Return; or to define it more precisely, of Decreasing Real Cost. By this is meant that a high output of manufactured goods in general, or of any particular type of manufactured goods, can in the long run be obtained at a lower real cost per unit of output than a low output. "Real Cost" refers to the quantities of all factors of production, not only labour, used up in the process of production. In order to obtain a satisfactory measurement of real costs, it is necessary that we should be able to reduce money costs to real units and also have determinate terms of exchange between the values of different factors of production. These considerations militate against comparisons over very long periods or between countries in widely different circumstances; though, as is shown below, they cause in effect no serious difficulty for comparisons over a period of nearly a century.

If this far-reaching generalisation is true (and we shall show below that, subject to certain qualifications, it is true), we should expect it to determine average real cost per unit of output in manufacturing or average net return per unit of factors of production employed, not only temporally but also spatially; this is to say, to throw light on not only changes through time, but differences of productivity in different countries.

Undoubtedly the most important contribution to the theory of increasing returns was that of Allyn Young, of Harvard. The present writer had the privilege of working as his research assistant during the last few months of his life, when he was Visiting Professor in London (he died early in 1929). His paper "Increasing Returns and Economic Progress"[1] leads up to the following conclusions:

"First, the mechanism of increasing returns is not to be discerned adequately by observing the effects of variations in the size of an individual firm or of a particular industry, for the progressive division and specialisation of industries is an essential part of the process by which

[1] *Economic Journal*, December 1928.

increasing returns are realised. What is required is that industrial operations be seen as an inter-related whole. Second, the securing of increasing returns depends upon the progressive division of labour, and the principal economics of the division of labour in its modern forms are the economies which are to be had by using labour in roundabout or indirect ways. Third, the division of labour depends upon the extent of the market, but the extent of the market also depends upon the division of labour. In this circumstance lies the possibility of economic progress, apart from the progress which comes as a result of the new knowledge which men are able to gain, whether in the pursuit of their economic or of their non-economic interests."

In the first part of his paper, Young contended — it is quite a familiar line of reasoning now, but was novel then — that the great differences in real product per man-hour between American and British manufacture were simply due to the greater size of the market, not to any other cause.

"Those who hold that American industry is managed better, that its leaders study its problems more intelligently and plan more courageously and more wisely, can cite no facts in support of their opinion save the differences in the results achieved. Allowing for the circumstance that British industry, as a whole, has proved to be rather badly adjusted to the new post-war economic situation, I know of no facts which prove or even indicate that British industry, seen against the background of its own problems and its own possibilities, is less efficiently organised or less ably directed than American industry or the industry of any other country.

"Sometimes the fact that the average American labourer works with the help of a larger supply of power-driven labour-saving machinery than the labourers of other countries is cited as evidence of the superior intelligence of the average American employer. But this will not do, for, as every economist knows, the greater the degree in which labour is productive or scarce — the words have the same meaning — the greater is the relative

economy of using it in such indirect or roundabout ways as are technically advantageous, even though such procedure calls for larger advances of capital than simpler methods do.

"It is encouraging to find that a fairly large number of commentators upon the volume of the American industrial product and the scale of American industrial organisation have come to surmise that the extent of the American domestic market, unimpeded by tariff barriers, may have something to do with the matter. This opinion seems to be forced upon thoughtful observers by the general character of the facts, whether or no the observers think in terms of the economists' conception of increasing returns. In certain industries, although by no means in all, productive methods are economical and profitable in America which would not be profitable elsewhere."

In fact Young used to suggest (in private discussion) that if only the British population could be raised to 100 millions, productivity of manufacturing industry would be so greatly increased that the whole country would be much better off economically, even if there were some difficulty with the terms of trade.

But this is too much of a good thing. When we examine all the data in the table (most of which were not available in Young's time) we can see high real product per man-hour in some small countries such as Canada and New Zealand, and low figures for some large countries. Young has unconsciously identified the concepts of a large market and of a large nation. This is understandable in a mind brought up in (even if it may have questioned it) the American Protectionist tradition, which seeks to place barriers around the national market and to reserve it for its own manufactures.

This criticism of the "large market" theory was brilliantly and forcefully stated in a posthumous article by Erwin Rothbarth.[1] Rothbarth was an able young statistician who was employed as an assistant by Lord Keynes in

[1] "Causes of the Superior Efficiency of U.S.A. Industry Compared with British Industry", *Economic Journal*, December 1946.

1939. As a refugee, he was not obliged to do military service, but deliberately sought a place of danger in Normandy where he was killed in 1944.

Rothbarth was one of the first to point out the wide discrepancy between British and American manufacturing productivity which existed as early as 1870, when the American market was still comparatively small. In the case of successful smaller countries like Canada and New Zealand, we know that this high productivity is generally achieved by concentrating on a limited range of products, and selling these products in a world market. In this sense, any small country has a world market at its disposal if it wishes. Why some small countries take advantage of this, and others do not, is a question which must be left for further examination. The reasons will be found to be sometimes geographic, sometimes economic and sometimes social.

Much effort has been fruitlessly expended in the past in attempting to find statistical correlation between scale of production and productivity per man. These comparisons can be made between firms in an industry, or between industries in different countries, at any one time; or attempts can be made to relate rates of change of size of industry with rates of change of productivity per man.

The first point to be borne in mind is that most of the data available to us are in money terms. The amount of information available in real terms is still very limited. It might at first be thought that we could use money values in comparing the productivity of the same industry in different countries, or in comparing rates of average of productivity of different industries within one country. But this is to forget the obvious fact that most if not all of the fruits of increasing returns may be passed on to the buyer. We can only assume that money values give an adequate measure of the trend of real values if we know that the goods are sold in the same market, which is often not the case when we are comparing industries in different countries. Even if we are comparing different firms

within one industry in one country at one time, a certain amount of caution is still necessary. The market may be imperfect, and the same goods may in fact be being sold at lower prices by the more successful firms, and at higher prices by the less successful. These may be imperfections arising out of lack of knowledge by the buyer or his suspicion of new products, or imperfections arising out of advertising, or of different channels of sales. More easily understandable in the case of certain heavier and bulky products is the simple transport imperfection of the market, whereby as a producer increases his scale of operations he has to lower his prices at works considerably if he wishes to sell in more distant markets.

Comparisons between firms of different sizes (as measured by labour force) within one industry yield surprisingly inconclusive results. The 1930 census of production of Great Britain provided material for such analysis, and it was found that only in a few industries was there a marked positive correlation between size of firm and output per person employed. In some cases the results give a "bell"-shaped curve with productivity highest in the middle range of size, lowest for unusually large or unusually small businesses, but in other cases the opposite result, or U-shaped curve, was obtained, where productivity was highest in large and small businesses and less in the middle ranges.

Classification of Groups showing Size of Firm and Output per Person Employed

(Great Britain, Census of Production 1930)

Class I.—Showing marked positive correlation: Ice; grain milling; iron and steel tubes; petroleum refining; butter and cheese; fellmongery; seed-crushing.

Class II.—Moderate positive correlation: Copper and brass; woollen and worsted; rope and twine; tin plate; iron foundries; slate mines.

Class III.—U-shaped: Lead, tin and aluminium; cotton

spinning; salt mines; metalliferous mines; silk; canvas and sack; sugar; iron and steel blast furnaces.

Class IV.—"Bell"-shaped: Wire; non-metalliferous mines; timber.

Class V.—Negative correlation: Cotton weaving; iron smelting; jute; linen and hemp; textile finishing.

The evidence so far gives only very moderate support to the theoretical concept that there is, for any industry, an optimum scale of operations, even if we allow that the position of this optimum may change fairly rapidly from time to time. Reliable statistical studies of the optimal scale of production are few, and Professor Jewkes's study,[1] using American data, still holds the field. Professor Jewkes found an optimum size, from the point of view of costs, in bakeries at an output of 15–20 million lb. per year. (It may be pointed out that a bakery of this size would supply bread to nearly 100,000 people; even if it has driven many of its competitors from the field, it will have to meet substantial transport costs in delivering so large an output of a non-storable commodity.) Professor Jewkes found optima for steel and copper refining at 300,000 and 100,000 tons per year respectively, and for flour milling an optimal range between 300,000 and 700,000 barrels of flour per annum. These are all, however, plants which are handling products which are heavy and bulky in relation to their value, and where the optimal scale may be imposed by transport costs. For petroleum refining Professor Jewkes was unable to find an optimum.

A more recent study[2] estimates, from considerations of the best balance between different sections of the plant, that the optimal output for a boot and shoe firm was 5–6000 pairs per week, with a personnel somewhere between 275 and 375.

It is to be expected that these figures will change considerably as technical and economic conditions change.

[1] *Journal of the Manchester Statistical Society*, January 1932.
[2] Silberman, *Oxford Economic Papers*, No. 3.

Cotton was one of the industries which, on British data, give a definite negative correlation between size of firm and output per head. It might have been thought at first that this was due to the chronically depressed condition of British cotton production, which was particularly marked in 1930. It is interesting to see, however, that a similar negative correlation was found for Indian cotton mills in a recent study.[1] The results indicate a definite *minimum* output per man when the firm employs about 2000 workers. Above that figure there is some rise, but not back to the level of the smaller firms.

TABLE XI

Number of Employees	Lb. of Cotton used per Employee per Day
Under 250	15·3
250– 499	15·1
500– 749	15·4
750– 999	11·9
1000–1249	12·4
1250–1499	12·7
1500–1749	12·3
1750–1999	10·7
2000–2249	9·7
2250–2499	13·5
2500–2749	14·7
2750–2999	13·7
Over 3000	12·4

These results surely have some bearing upon the view which Gandhi used to express, that, while he welcomed Indian industrialisation, there was no need for it to be concentrated in industrial cities, but that small plants should be scattered throughout the Indian countryside. (Spinning cotton on a hand spindle was undertaken by him as an act of personal asceticism, and he did not call for its universal application.)

[1] By Mr. T. Joseph, of the Office of the Economic Adviser to the Indian Government, New Delhi. Privately communicated.

For long-period studies of the productivity of individual industries the amount of material available is also disappointing. The pioneer in this field was G. T. Jones, a pupil of Allyn Young, in his book *Increasing Returns*.[1] Jones unfortunately was killed in a motoring accident in the same year as Young died, and he has had few followers.

He based his investigation on time comparisons over a long period in five industries, namely the building, cotton and iron industries in Great Britain, and the cotton and iron industries in the U.S.A. His measure of increasing return was somewhat wider than that used above, namely the quantity of all economic resources (and not merely labour) which had to be expended to obtain one unit of physical product. It will be noticed that in each of the industries concerned the output is, subject to some assumptions, reducible to physical units. To measure the progress of increasing returns, he made use of the ingenious device of "real cost". His starting-point is the price actually charged for the products of the industry in different years. In the case of the iron and cotton industries he takes the average prices of certain staple lines, and in the case of building the price of a composite piece of building work including a number of different operations. The "prices" (inclusive of profits and not merely costs) of various building operations are taken from a builder's price-book, judged by authorities to represent a fair measurement of prices actually being paid for sub-contracts.

He then deflates this actual price by an index number indicative of changes in the prices of the factors of production (including profit). The precision of this method clearly depends on the weighting of this index number, but he was able to show by an experimental test that his results were in no case seriously affected by the adoption of possible alternative systems of weighting. The weights are based on the make-up of the price at a standard date, generally the year 1910. Raw materials were included as

[1] Cambridge University Press, 1933.

a factor of production, and changes in their price incorporated in the index number; thus account was taken of any economies or diseconomies in the use of materials as well as of labour, as the scale of production increased. That part of the price representing profit in the base year was given a weight in the index number, and deflated year by year in accordance with changes in interest rates; and unallocatable costs entering into the price were deflated by the use of a general price index number. In this way he was able to obtain index figures of the real cost of producing a number of these articles over a considerable period.

TABLE XII

SCALE OF PRODUCTION AND REAL COST PER UNIT

(Figures based on 1913 or adjacent year; Real Cost at seven- or ten-year moving average)

Years	English Building Industry	
	Output from Numbers at Work as shown by Census	Real Cost per Unit
1851	44·0	115·7
1861	52·1	109·3
1871	63·8	105·5
1881	77·7	108·2
1891	79·5	104·8
1901	107·3	99·7
1911	100·0	100·0

Years	Lancashire Cotton Industry	
	Output, Yarn and Cloth	Real Cost, Ten-year Moving Average
1855	37·3	111·6
1875	58·5	100·0
1885	71·9	96·9
1895	81·2	96·8
1905	82·9	95·6
1910–13	100·0	100·0

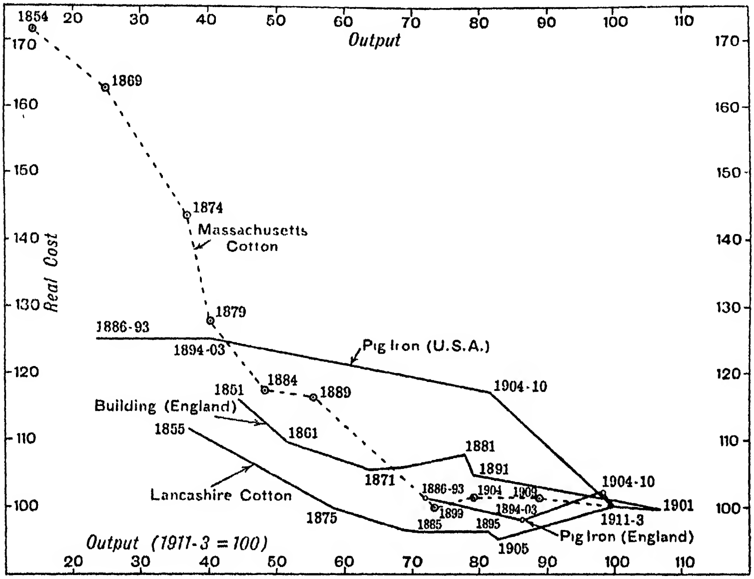
[*contd. overleaf*

Years	Great Britain			U.S.A.		
	Output of Pig-iron	Output per Furnace in Blast, thousand tons per day	Real Cost	Output of Pig-iron	Output per Furnace, thousand tons per day	Real Cost
1886–1893	72·1	28·1	101·2	26·7	25·4	125·1
1894–1903	86·5	34·6	98·4	41·1	51·0	125·0
1904–10	98·6	42·8	102·0	81·2	86·0	117·4
1911–13	100·0	45·4	100·0	100·0	112·4	100·0

Years	Massachusetts Cotton Industry	
	Output (Active Spindles)	Real Cost, Seven-year Moving Average (year's figures for 1914)
1854	14·4	181
1859	15·8	193
1865	18·1	206
1869	24·8	170
1874	36·5	148
1879	40·2	131
1884	48·6	120
1889	55·1	119
1899	73·7	101
1904	79·6	102
1909	88·7	101
1914	100·0	100

The results of all these investigations are shown in the diagram. They are surprising enough in any case. In the building industry the reduction in real costs has been very moderate indeed. Over the space of sixty years a reduction of only 17 per cent was obtained, and the tremendous expansion of building which took place in the ten years between 1891 and 1901 gives a fall of 5 per cent only in real costs. Jones points out that this decline in real costs can almost entirely be attributed to the introduction of machinery into the joinery workshops. Some would regard this as an adventitious invention, but he is

satisfied that its main casual factor was in the expansion in the size of the industry, and that this may be regarded as a true economy of increasing return.



Jones's results for building have been brought up to date using the same method (slightly improved).[1] Real cost, still measured on a 1910 base, took the following course :

1923	103	1932	102
1924	95	1933	99
1925	92	1934	102
1926	91	1935	94
1927	92	1936	88
1928	94	1937	85
1929	96	1938	90
1930	99	1939	91
1931	101		

These latter years were a period of considerable expansion in the building industry. There are a few

[1] Saville, *Yorkshire Bulletin of Economic and Social Research*, September 1949.

modern economies of scale, such as the use of mechanical equipment, but there are clearly also a number of important diseconomies of scale, in having to employ men of less strength and skill as operations expand, also apparently, in the building industry at any rate, a considerable deterioration in employer-employee relationships, with consequent increased cost of supervision.

In the case of the Lancashire cotton industry the results are much more striking. Such possibilities of cost reduction as there were seem to have been exhausted as early as 1885, and indeed since that date real costs have tended to rise slightly in spite of increasing output. But the whole reduction during the best period in real costs was not more than 15 per cent. In the Massachusetts cotton industry, where the expansion in size was much greater, there was also a very marked fall in real costs, which fell from 170 units to 100.[1] But it is interesting to notice here that all possibilities in the way of reducing real cost seem to have come to an end by 1899. Between 1874 and 1898 the relative expansion of the Massachusetts cotton industry was about as great as that of the Lancashire cotton industry between 1855 and 1885. Yet the reduction in real cost was much greater in the U.S.A. than in Lancashire. This shows that factors other than the mere rate of increase must be at work.[2]

Mr. Rostas (*Economic Journal*, June-September 1945), summarising the findings of the official Cotton Textile Mission to the U.S.A., finds U.S. output per man-hour 1·63 of British in spinning, 2·65 of British in weaving, or 2·15 in all. Assuming these ratios apply to the comparison between Britain in 1937 and U.S. in 1939, it is possible to link the British and American series which Mr. Rostas

[1] In the diagram the figures plotted are slightly different from those given in the table. The figures in the diagram are the mean of the results obtained by two different systems of weighting. The abnormal period of the civil war is omitted from the diagram.

[2] It may also be mentioned that in the Indian cotton industry, where employment rose from 44,000 in 1880 to 418,000 in 1936, output per man, as measured by the quantity of cotton consumed, remained more or less stationary in the neighbourhood of 3000 lb. per head per year (*Economist*, 2nd July 1938).

gives. His series for Japan[1] (data for 1929–31 and 1934–37 added from *International Labour Review*, October 1939) can also be linked if we assume that in its base year, 1923, American efficiency per man-hour was $4\frac{1}{2}$ times Japanese (Professor Taussig's comparisons, relating to 1920, make the American cotton industry about $3\frac{1}{2}$ times as efficient per man-day).

TABLE XIII

Country	1907	1909	1923	1924	1925	1929	1930	1931	1933	1934	1935	1937	1939
U.S.A. .	..	1	1·26	..	1·39	1·52	..	1·58	1·69	..	1·85	1·95	2·27
Britain .	·69	..	..	·75	..	..	·73	..	0·89	·89	0·91	1·01	..
Japan .	..	..	0·28	..	..	0·50	·55	0·62	0·67	·69	0·63	0·64	..

In the table, U.S. output per man-hour in 1909 is taken as the base for all three countries.

After a very rapid rise, there appears to have been some deterioration in Japan after 1934.

These suggestions are also of importance in the case of pig-iron. The British pig-iron industry between 1880 and 1913 "provided an almost return to human endeavour", as Jones puts it.[2] The American industry, on the other hand, showed a very slow rate of reduction of real costs in the earlier years, rapidly accelerating in the closing period.

In the case of this industry, fluctuations due to the trade cycle are so great that the data have been averaged over periods which are set out to comprehend all the phases of one cycle. The rising output of the industry in Great Britain was associated with a sharper rise in average

[1] In the spinning of coarse yarns (up to 40's) Japan is at the best relative advantage, her real product per man-hour in 1936 being 69 per cent of Britain's and 55 per cent of U.S.A.'s in these lines (Forchheimer, *Quarterly Journal of Economics*, November 1947). But in woven cloths Japan's relative advantage appears to be the same in low and high qualities—in both cases her money labour costs in 1931 were 42–43 per cent of Britain's. Her overhead costs were only 5–10 per cent below Britain's, and for the low-quality cloths she bought her raw cotton 10 per cent cheaper. In total costs Japan was below Britain by some 16–17 per cent in both qualities.

[2] Coal used per ton of pig-iron (from Mundella, *Journal of the Royal Statistical Society*, 1878, and Census of Production) was as follows (tons):

1787 . . .	9·0	1876 . . .	2·4
1840 . . .	3·5	1935 . . .	1·7
1869 . . .	3·0		

output per furnace, but even so, this led to no reduction in real cost. In the U.S.A., on the other hand, the average size of furnace expanded nearly fivefold, and these greatly enlarged furnaces under American conditions seem to have worked at substantially lower real cost.

The pig-iron industry is undoubtedly of great interest, as is seen from the perhaps undue attention which it has received from economists. Being dependent on the transportation of raw materials which are at the same time bulky and limited in supply, it is, like primary producing industries, sometimes subject to definite diseconomies of large scale, and this appears to have been the case with the English industry during the period in question. Differing geographic and industrial conditions in America, on the other hand, left a net balance of increasing returns as the result of large-scale operation. It is interesting to notice that after 1920, when the output of pig-iron from this district in Great Britain was greatly diminished, the average real cost fell, though by less than 10 per cent.

After looking at all this evidence we may now consider a bold generalisation which has recently been proposed by Dr. Verdoorn, of the Netherlands Government Economic Planning Bureau, suggesting that increasing real product per man-hour is a function of aggregate real product, and that the level of the former is proportional to the square root of the latter.

This or any similar generalisation must meet at the start a logical difficulty as to how we should define an "industry" for this purpose. Suppose that, for a start, we arbitrarily define an industry carried on in two adjacent regions as two separate industries, and then decide to define it as a single industry, do we thereby increase its size and raise its productivity?

What Dr. Verdoorn and other workers in this field have done in effect is to define as a single industry that carried on within the boundaries of one nation, as Young did, and thereby lay themselves open to the same risk of error.

Though we are on treacherous ground, we can, however, still hope to draw a few conclusions. To demarcate

industries by national boundaries is meaningful for economic purposes when the provision of equipment, supplies of components and of ancillary services — in a word, all the conditions which make increasing returns possible — are organised, on the whole, within the nation, and not internationally.

Dr. Verdoorn [1] finds a theoretical basis for his generalisation in "the learning curve". Improvements in the organisation of the manufacturing process have to be "learnt" before they can be instituted in practice, and recent war-time experience has provided some interesting evidence on this question. We might expect the value of such improvements "learnt" to be a function of the aggregate experience of the industry, and this is often found to be the case. In the rapidly expanded U.S. aircraft industry during the war, the man-hours of labour required per lb. of air-frame produced, and the cumulative total weight of air-frame produced to date, when plotted on a double logarithmic diagram, were found to be in almost exact linear relation with each other. This appeared to be the case whether data were taken for a single plant or for the industry as a whole. Over the period studied, the man-hour requirements per lb. of air-frame were reduced to one-fifth and in some cases even one-seventh of what they had been in the initial stages. The slopes of the curves for the different types of planes were found to be of about the same order of magnitude, ranging from 0·7 to 0·65.

This interesting concept is only directly applicable to an industry which has started practically from zero. Where we are examining an industry which has been going on since the beginning of civilisation, such as building, we obviously cannot use the same method. Of all the industries covered by Jones, the only one which can be examined in the light of this relationship is the Massachusetts cotton industry, for which we have data practically right back to

[1] A preliminary statement of his theory and evidence is given in English in the Italian periodical *L' Industria*, No. 1, 1949. Other statements are available in Dutch, including *Overdrukken* No. 22 of the Centraal Planbureau, an interesting document which uses this theory to predict some of the industrial consequences of an economic unification of Europe.

its initiation. Dr. Verdoorn plots product per man-hour as a function of cumulated production since the beginning of the industry, and finds once again an almost precise double logarithmic relationship, with a slope of 0·67.

He then examines numerous other data, both of national aggregates of industrial production and of production in individual industries, and finds that in a great many cases productivity per man-hour bears a square root relationship to total (not cumulated) product. Of interest also is his analysis of the Monnet Plan in France and the Saraceno Plan in Italy, where the compilers of the plans were, in effect, recording engineers' judgments of the savings in labour requirements per unit of output which were to be effected as production increased. Though the coefficients differed considerably between different industries, being highest in automobiles and textiles and less in public utilities, the weighted average of coefficients for all industries worked out at 0·51 for France and 0·52 for Italy.

A better success still was scored by analysing Dr. Rostas's results.[1] Defining the ratio of American to British productivity per man-hour in any industry as p, and the volume of American output as compared with British as v, then a logarithmic diagram (see page 359) gives the relation

$$p = 1{\cdot}26\ v^{0{\cdot}48}.$$

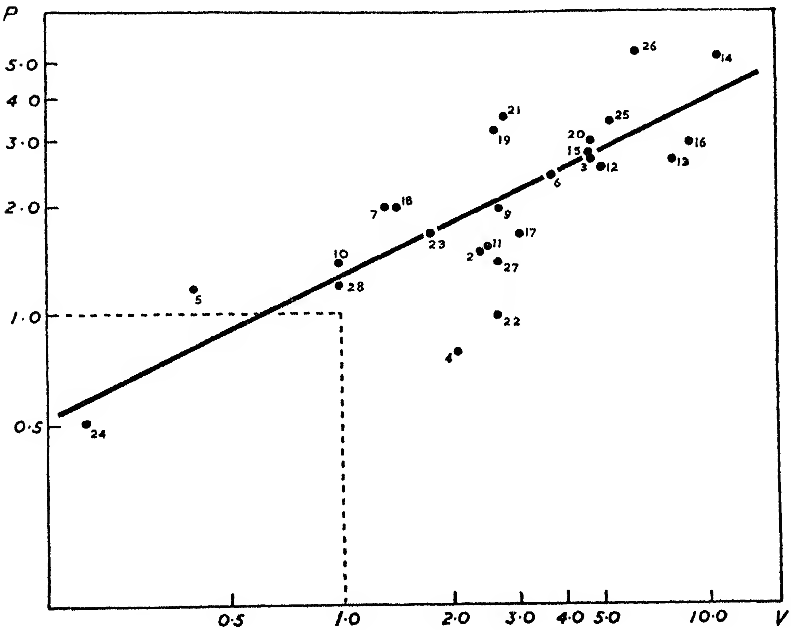
The implication is that, where the American manufacturer does not enjoy any relative advantage of scale compared with the British manufacturer, his real product per man-hour is only 26 per cent higher. But this conclusion cannot be expounded too categorically. It would be instructive to prepare a similar diagram for an earlier date, and to see whether the supposed advantages of scale affect productivity in the same manner.

It is interesting to see that the relation holds in reverse for the one industry in which British output is greatly in excess of American, namely fish curing. Britain, however,

[1] National Institute of Economic and Social Research, "Comparative Productivity in British and American Industry", *Occasional Papers* 13. The analysis refers to British data of 1935 and American data of 1939 and compares productivity in real, not money terms.

fails to register a gain in relative productivity in the other industry in which there is a relatively large total output, namely bricks — perhaps the very high transport costs on this product prevent the economies of scale from being obtained. Markedly below the line, i.e. showing relatively high efficiency in Britain, were cement and beet sugar.

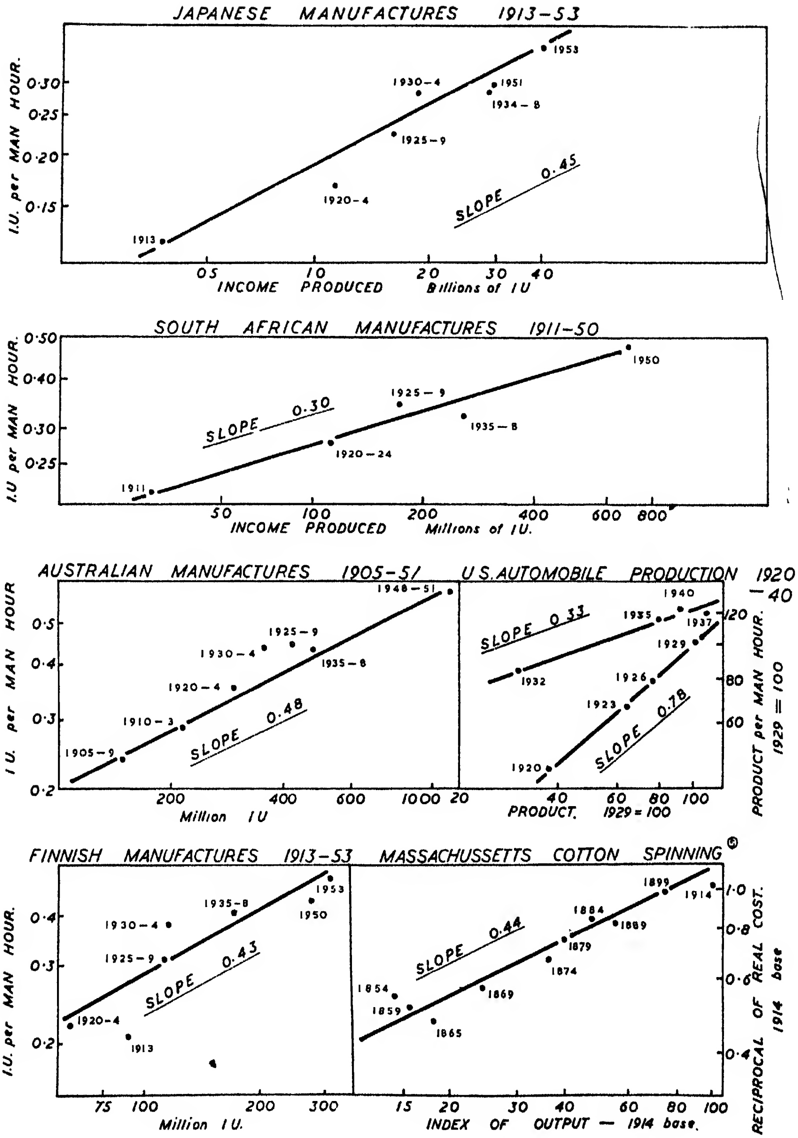
Unfortunately, however, there is also plenty of evidence that the slope is by no means always in the neighbourhood



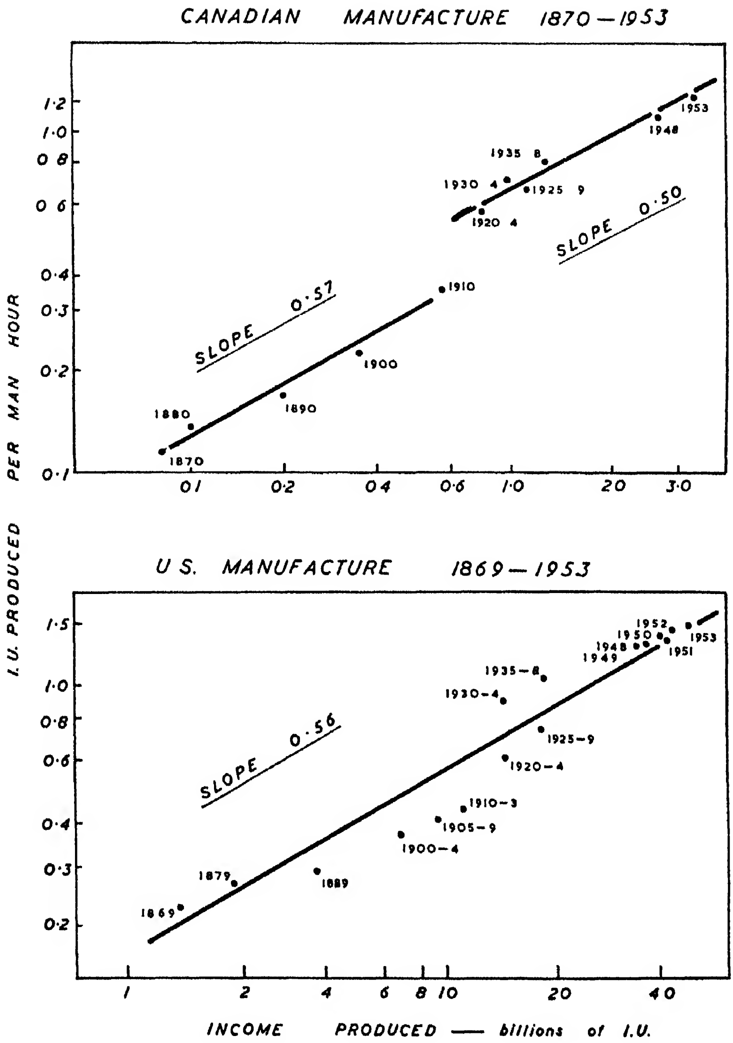
of 0·5, and that it may change from time to time. Dr. Verdoorn, in this field, may prove to have played much the same role as Pareto in the field of income distribution. He has discovered an important truth in showing that there is a logarithmic relation between these two variables, though he may be mistaken in thinking that the slopes of these distribution curves always tend to be the same.

In the following diagrams some data are drawn from the preceding tables, and others from sources indicated.

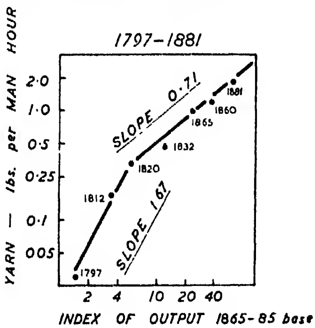
[contd. on p. 363



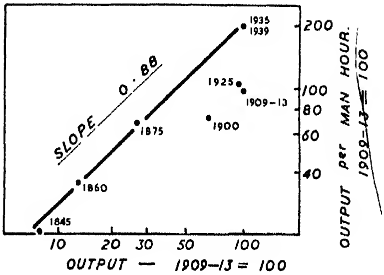
Data from G. T. Jones, *Increasing Returns.*


CANADIAN MANUFACTURE 1870—1953
SLOPE 0·57
SLOPE 0·50
1870
1880
1890
1900
1910
1920 4
1925 9
1930 4
1935 8
1948
1953
1·2
1·0
0 8
0 6
0·4
0·3
0·2
0·1
01
0·2
0 4
0·6
1·0
20
3·0
U S. MANUFACTURE 1869—1953
SLOPE 0·56
1869
1879
1889
1900—4
1905—9
1910—3
1920—4
1925—9
1930—4
1935—8
1948
1949
1950
1951
1952
1953
1·5
1·0
0·8
0·6
0·4
0·3
0·2
1
2
4
6
8
10
20
40
I. U. PRODUCED PER MAN HOUR
INCOME PRODUCED —— billions of I.U.

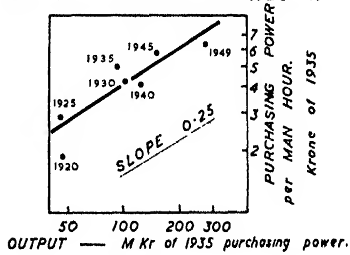
ENGLISH COTTON SPINNING[1]



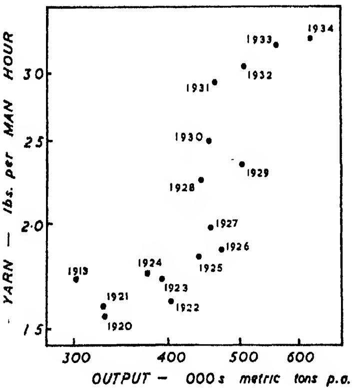
BELGIAN ZINC[2] 1845–1939



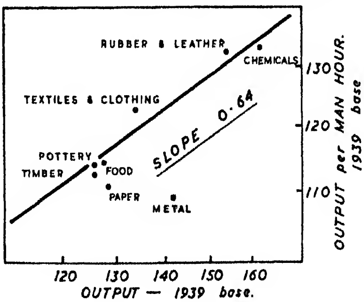
SWEDISH SHIPBUILDING[4] 1920–49



JAPANESE COTTON SPINNING[3] 1913–34



SWEDISH INDUSTRIES 1939–48

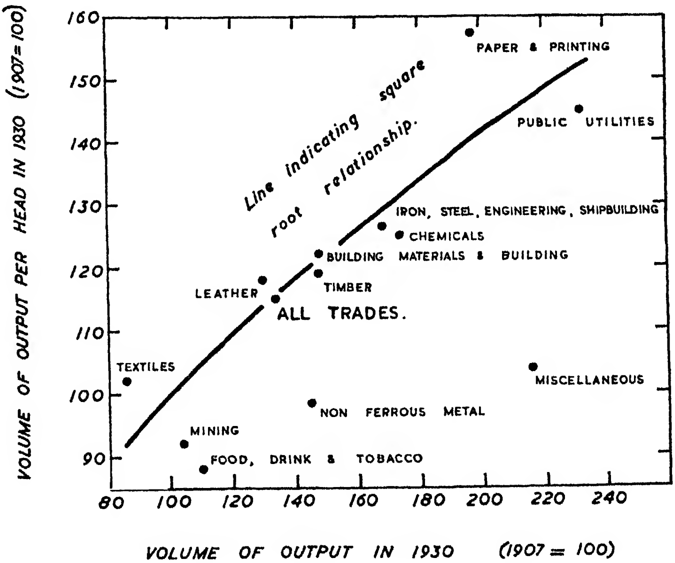


[1] Schultze-Gavernitz's data.
[2] Data from *Bulletin* of the University of Louvain. Feb. 1950.
[3] Data from *Statistisches Handbuch der Weltwirtschaft.*
[4] Data from Index. Dec. 1950.

All the diagrams are drawn on double logarithmic scale. It is seen that the two variables are often (if not always) in linear relation, but that there may be, from time to time, quite significant changes of slope, and that there is only a very general tendency to get slopes in the neighbourhood of 0·4.

Besides the data shown in the above diagrams, we can make a more detailed examination, industry by industry, for Britain and U.S.A.

The following diagram relates to productivity of different industries in Britain in 1907 and 1930. The 1907–24 link is that deduced by Professor Douglas and Mr. Tolles[1] brought up to 1930 by means of the official estimates.



This diagram is drawn on a natural, not logarithmic, scale, and the line indicating the square root relationship is marked in. It seems to fit the data fairly well.

The trend of real product per man-hour in different industries can be analysed and compared with the rate of

[1] *Journal of Political Economy*, February 1930.

growth of the industry from abundant data compiled by Mr. Solomon Fabricant (*Employment in Manufacturing*, National Bureau of Economic Research, 1942). The data are grouped into three periods — pre-1899, 1899–1929, 1929–39 — and shown on the diagrams (pages 365–7). The primary object of the diagrams is to see whether increase in output per man-hour is dependent upon increase in total output.

We obtain the interesting result that the slope of the line appears to be becoming steeper while at the same time it is shifting upwards: i.e. that increasing total output has a more beneficial effect upon output per man-hour than it had in the nineteenth century, but that for an industry to have a stationary total output, which probably meant a stationary level of output per man-hour in the nineteenth century, allowed a rise in output per man-hour at the rate of 15 per cent per decade in the period 1899–1929, 33 per cent per decade in the period 1929–39.

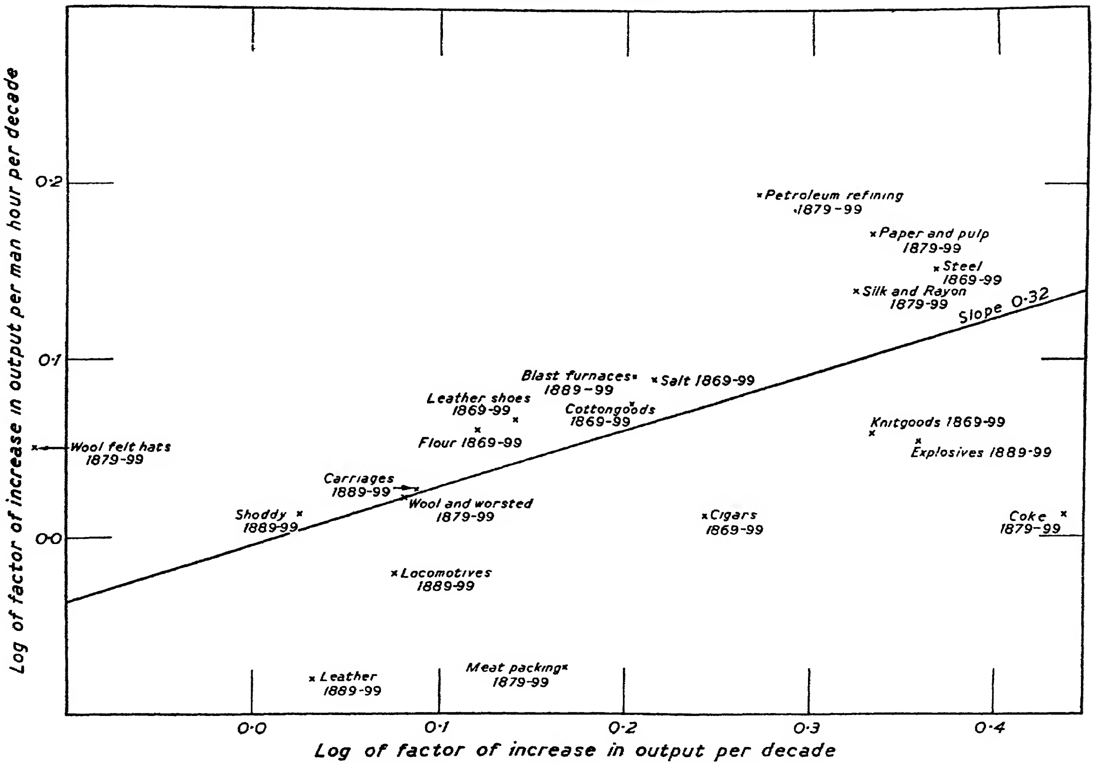
Pre-1899 data.—Only available for a few industries, and giving employment rather than man-hours per unit of output. The general change in industrial hours over this period has been assumed to be applicable to the industries in question.

1899–1929.—For the following industries Mr. Fabricant gives comparisons of wage-earner man-hours per unit of product, for 1909 and 1929:

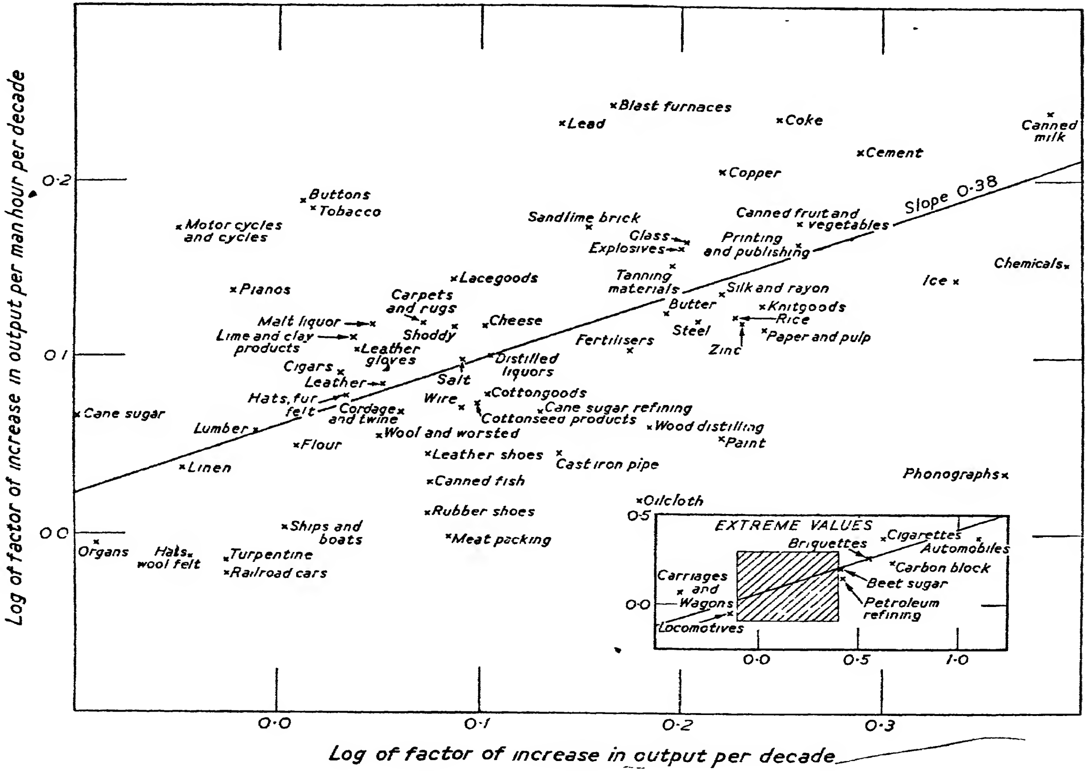
Beet sugar	Silk and rayon
Distilled liquors	Cotton goods
Carpets and rugs	Flour
Hats, fur felt	Leather shoes
Lumber	Meat packing
Paper and pulp	Wool and worsted
Printing and publishing	Petroleum refining
Paint	Blast furnaces
Automobiles	Leather
Knit goods	Cement

Change in output per man-hour between 1899 and 1929 is calculated in the manner shown by the illustration for beet sugar (immediately after diagrams).

PRE-1899 DATA



1899–1929


Log of factor of increase in output per man hour per decade
Log of factor of increase in output per decade
0·2
0·1
0·0
0·0
0·1
0·2
0·3
Slope 0·38
Blast furnaces
Lead
Coke
Cement
Canned milk
Copper
Buttons
Tobacco
Motor cycles and cycles
Sandlime brick
Glass
Explosives
Canned fruit and vegetables
Printing and publishing
Chemicals
Tanning materials
Silk and rayon
Ice
Lacegoods
Pianos
Carpets and rugs
Cheese
Butter
Knitgoods
Rice
Paper and pulp
Malt liquor
Lime and clay products
Shoddy
Leather gloves
Fertilisers
Steel
Zinc
Cigars
Leather
Distilled liquors
Salt
Hats, fur felt
Cordage and twine
Wire
Cottongoods
Cane sugar refining
Cottonseed products
Cane sugar
Lumber
Wool and worsted
Wood distilling
Paint
Flour
Leather shoes
Cast iron pipe
Linen
Canned fish
Phonographs
Oilcloth
Rubber shoes
Ships and boats
Organs
Hats, wool felt
Turpentine
Railroad cars
Meat packing
EXTREME VALUES
0·5
0·0
Briquettes
Cigarettes
Automobiles
Carbon block
Beet sugar
Petroleum refining
Carriages and Wagons
Locomotives
0·0
0·5
1·0

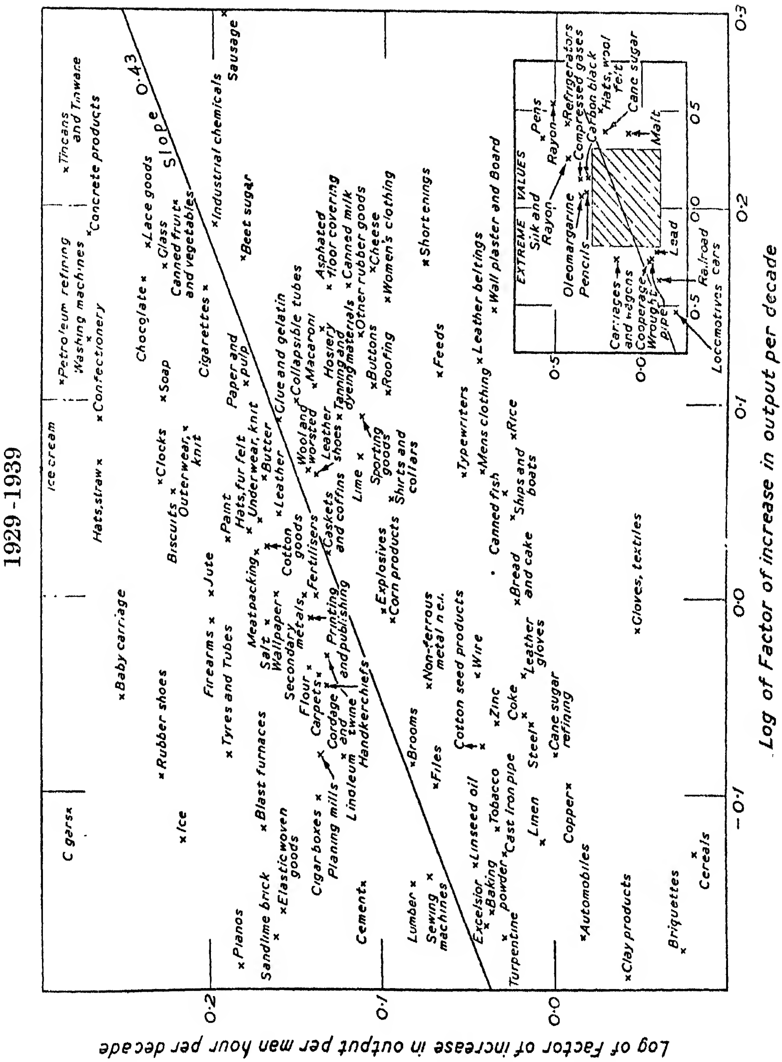

1929-1939
Log of Factor of increase in output per decade
Log of Factor of increase in output per man hour per decade
Slope 0·43
EXTREME VALUES
Silk and Rayon
Oleomargarine
Pencils
Carriages and wagons
Cooperage
Wrought pipe
Locomotives
Railroad cars
Lead
Malt
Cane sugar
Hats, wool felt
Carbon black
Compressed gases
Refrigerators
Rayon
Pens
Sausage
Industrial chemicals
Beet sugar
Concrete products
Tincans and Tinware
Petroleum refining
Washing machines
Confectionery
Ice cream
Hats, straw
Cigars
Baby carriage
Rubber shoes
Ice
Chocolate
Lace goods
Glass
Canned fruits and vegetables
Soap
Clocks
Biscuits
Outerwear, knit
Cigarettes
Paper and pulp
Jute
Firearms
Tyres and Tubes
Blast furnaces
Pianos
Sandlime brick
Elastic woven goods
Cigar boxes
Planing mills
Cement
Lumber
Sewing machines
Excelsior
Baking powder
Turpentine
Linseed oil
Tobacco
Cast iron pipe
Linen
Copper
Automobiles
Clay products
Briquettes
Cereals
Gloves, textiles
Shortenings
Feeds
Leather beltings
Wall plaster and Board
Typewriters
Mens clothing
Rice
Canned fish
Ships and boats
Bread and cake
Leather gloves
Cane sugar refining
Coke
Steel
Zinc
Wire
Cotton seed products
Non-ferrous metal n.e.s.
Files
Brooms
Explosives
Corn products
Shirts and collars
Sporting goods
Lime
Buttons
Roofing
Cheese
Women's clothing
Other rubber goods
Canned milk
Asphalted floor covering
Tanning and dyeing materials
Hosiery
Macaroni
Collapsible tubes
Glue and gelatin
Wool and worsted
Leather shoes
Leather
Butter
Underwear, knit
Hats, fur felt
Paint
Caskets and coffins
Cotton goods
Fertilisers
Meatpacking
Salt
Wallpaper
Secondary metals
Printing and publishing
Flour
Carpets
Cordage and twine
Linoleum
Handkerchiefs
0·2
0·1
0·0
−0·1
0·3
0·5

TABLE XIV

EXAMPLE: DATA FOR BEET-SUGAR

	Employment per Unit of Product (Base 1929)		Wage-earner Man-hours per Unit of Product	
	Wage-earners	Total Employment	Series A, Base 1937	Series B, Base 1929
1899	392	..	..	..
1909	212	200	289	..
1929	100	100	..	100
1933	94	88	102	77

In the first place total employment per unit in 1899 is estimated at

$$392 \times \frac{200}{212} = 370.$$

Then the Series A data for 1909 are placed on a 1929 base, i.e.

$$289 \times \frac{77}{102} = 218.$$

Man-hours per unit of product in 1899 (including non-wage-earners) are then estimated at

$$\frac{380}{212} \times 218 \times 1{\cdot}041.$$

The last factor represents the average reduction in industrial hours between 1899 and 1909, assumed to be applicable to this industry in default of specific information.

For the remaining industries man-hour data were not available and the figures of employment per unit of product were all adjusted by the factor 1·225, the general change in hours between 1899 and 1929.

The data for malt liquors and distilled liquors compare 1899 with 1939, the 1929 output under Prohibition being nominal only.

Data for the following industries are from 1904 to 1929:

Butter	Soap
Cheese	Cement
Canned milk	Lime
Canned fish	Organs
Oil-cloth	Pianos

Data for the following industries are from 1909 to 1929:

Cane sugar	Fuel briquettes
Cane-sugar refining	Wire
Corn products	

Data for the following industries are from 1914 to 1929:

Lace goods	Sand, lime, brick
Carbon, black	Cast-iron pipe
Clay products	Buttons

1929–39.—For the following industries man-hour data are available:

Beet sugar	Cement
Flour	Clay products
Meat packing	Lumber
Cigars	Blast furnaces
Men's clothing	Automobiles
Cotton goods	Paper and pulp
Wool and worsted	Printing and publishing
Silk and rayon	Paint and varnish
Leather	Petroleum refining
Leather shoes	

For the remaining industries the general change in hours is assumed to be applicable.

Increases in industrial productivity are often (but not always) brought about by increased use of capital equipment of various kinds. It will not do, however, to claim that the whole world can be raised to a high standard of productivity merely by an abundant provision of capital. Often considerations of the extent of the market, transport costs and other factors would make the installation of certain equipment entirely uneconomic, however easy it were to obtain the capital.

We should not, however, go too far in this direction and deny that the availability of capital, or the price of capital equipment, has any bearing on the question of whether or not manufacturers install it. Some recent

studies by Professor Melman[1] show that the relative extent to which certain pieces of industrial equipment were used in American and British industry was apparently a function of their relative price, in terms of man-hours of labour.

This point is brought out very neatly indeed in a recent French study.[2] In weaving with automatic looms an increase in the number of looms per weaver increases the product per unit of labour but decreases the product per unit of capital. The maximum productivity of labour, in this particular process, is attained with ten looms per weaver — beyond that point he is unable to give them adequate attention.

On the other hand, at present, from the employer's point of view, taking the cost of both labour and capital into account, the optimum results are obtained by working seven looms to a weaver. It is clear that a change in the price of looms relative to the wage of labour, or in the expected rate of return on capital, might alter the position of this optimum.

TABLE XV

Capital at 1860 Prices	1860	1924
Spindles (at 18s. each), £ million . .	25·2	42·7
Looms at £24 each	7·2	12·5
Working capital	20·0	30·0
Total capital at 1860 prices . .	52·4	85·2
Number of workers, thousands . .	400·0	528·0
Yarn produced and consumed, million lb.	1730·0 *	2567·0

* Average 1859–61.

Interesting early estimates of the amount of capital used in the cotton trade have been made by Chadwick[3] and by Levi.[4] Chadwick's figures are given in detail and

[1] Of the Department of Industrial Engineering, Columbia University. Privately communicated.

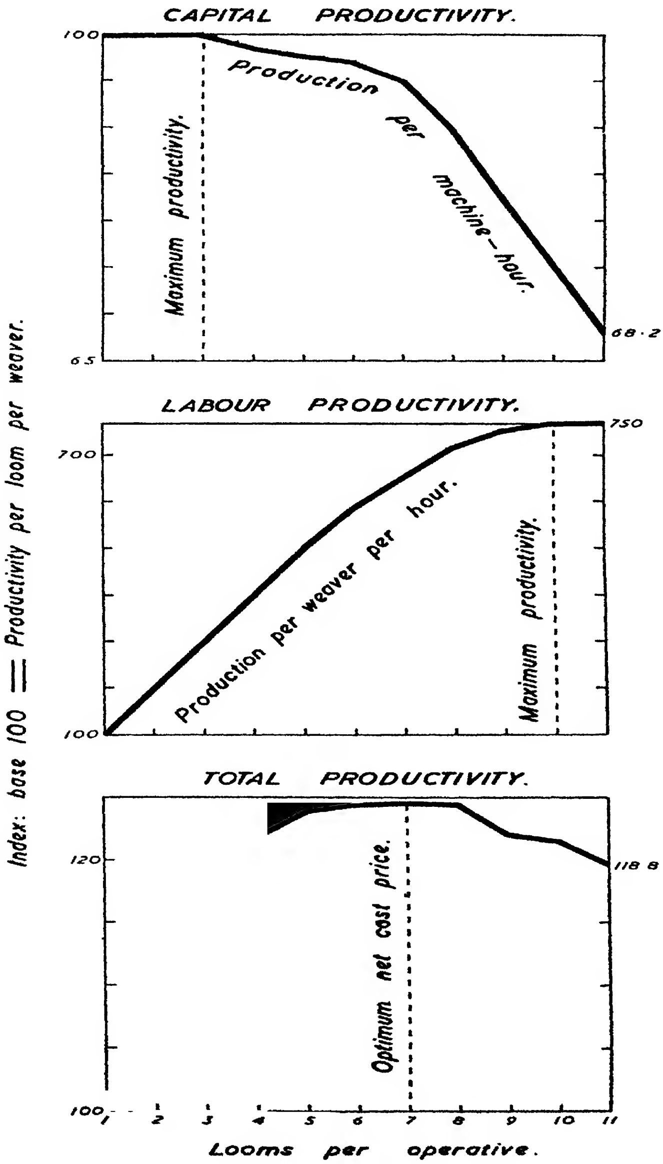
[2] Syndicat Patronal Textile de Roubaix-Tourcoing, April 1952. *Introduction à la recherche de la productivité dans l'industrie textile.*

[3] *Journal of the Royal Statistical Society*, 1860, p. 8.

[4] *Journal of the Royal Statistical Society*, 1863, p. 34.

TOTAL AND FACTOR PRODUCTIVITY.

Variations according to number of looms per weaver — automatic woollen looms.



it is possible to revalue the 1924 capital of the industry at 1860 prices for purposes of comparison.

The capital of the industry thus increased by 62 per cent over this period. The labour force increased by 32 per cent, but, allowing for shorter hours, was only about 2 per cent higher in 1924 than in 1860. Output measured in physical terms rose by 48 per cent, and allowing for the increasing proportion of the finer counts the true rise was probably greater. But most of this rise, according to Jones's figures, must have occurred in the twenty years immediately after 1860. The modal size of spinning firm rose from 20,000 spindles in 1884 to 110,000 spindles in 1924 (Ashton, *Journal of the Royal Statistical Society*, 1926, p. 577). In 1842, according to Acworth (*Journal of the Royal Statistical Society*, 1842, p. 74), a capital of £118 per worker would suffice. (He gives a most interesting account of a spinning mill of that period employing 440 workers at 10s. per week wages. The only other staff were a manager and a salesman at £200 per annum each.)

Professor Melman has also brought out an interesting point, that the number of administrative employees in manufacture per 100 production workers, which in 1900 was 10 in the U.S. and about 8 in Britain, has now risen to 22 in the U.S. and to 20 in Britain (and also appears to be somewhere between 20 and 25 in Soviet Russia). In the U.S. this increase in the proportion of administrative personnel has been accompanied by a rapid increase in real product per man-hour. Britain appears to have increased the administrative personnel without gaining the increase in real product.

Note.—Throughout the above chapter mining has not been included with manufacture. World figures of the output of all the principal minerals are readily available and I.U. values can be computed for each of them. This calculation excludes, however, the production of simple materials such as sand, gravel and clay.

The results are tabulated for the four years 1952, 1937, 1929 and 1913. The following table shows all countries in which mineral production exceeded 5 I.U. per head of population in 1952.

TABLE XVI

PRODUCTION OF MINERALS IN MILLIONS OF I.U.

	1952	1937	1929	1913
Belgian Congo	259	130	67	6
Gold Coast	64	48	22	6
Morocco (French)	46	8	5	0
N. Rhodesia	87	67	4	0
S. Rhodesia	18	22	17	17
S.W. Africa	22	7	13	23
Union of S. Africa	392	327	337	317
Canada	461	335	188	96
Mexico	232	186	198	103
Trinidad	35	20	10	0
United States	6,589	3746	3212	1690
Bolivia	47	37	49	27
British Guiana	17	4	3	0
Chile	127	122	91	14
Colombia	59	35	28	3
Dutch Guiana	19	2	1	0
Peru	65	49	43	15
Venezuela	1,024	269	177	0
British Borneo	54	7	7	0
Cyprus	13	14	3	3
Iraq	152	37	1	0
Malaya	59	83	68	50
Arabia	724	9	0	0
Austria	34	12	12	14
Belgium	53	52	48	40
Czechoslovakia	72	50	50	0
France	238	177	168	120
Germany	415	633	581	627
Luxembourg	11	11	12	12
Norway	19	30	26	8
Saar	28	23	23	23
Sweden	68	58	41	24
United Kingdom	442	465	488	475
Australia	136	128	82	157
New Caledonia	14	10	3	4
World, including countries not specified *	13,249	8407	6934	4312

* Excluding U.S.S.R. throughout, and China in 1952.

Little comment is needed at this stage, except to point out that the world's demand for minerals is increasing rapidly. Further analysis, however, shows that this increase largely represents petroleum and natural gas. Gold output shows considerable

fluctuations, due to changes in currency policy of the leading countries. The figures may be analysed further as follows:

TABLE XVII

	1952	1932	1929	1913
Petroleum and natural gas	7452	2967	2198	548
Gold	553	673	439	522
All other minerals . .	5244	4767	4297	3242

World output of all other minerals was rising at the rate of 1·7 per cent per annum between 1913 and 1929, 1·3 per cent between 1929 and 1937, and 0·7 per cent between 1937 and 1952 — a remarkable deceleration.

The other point to be noticed is the rapidity of the increase of mining output in a number of remote countries, and its comparative stationariness in some of the old-established mining countries. Output shows only a small increase in S. Africa and Malaya and an actual decline in Germany, Britain, Spain and Australia. The increase in the United States is almost entirely petroleum and natural gas.

CHAPTER VII

THE PRODUCTIVITY OF SERVICE INDUSTRY

We have so far reviewed the productivity of agriculture, with which we have included fishing and forestry; of manufacture; and of mining. There remains an important residue which we may describe for convenience as the "service industries". This classification covers, of course. a great variety of activities. Many of them are performed with the help of much less capital equipment than is required for manufacture or agriculture; but others, like railway, shipping or telephone services, are extremely expensive in equipment required per worker engaged.

It must be remembered that we have defined manufacture to include only manufacture carried out on a fairly large scale, generally the sort which is recorded in censuses of manufacturing production. Much of the smaller scale production of goods, such as baking, dressmaking and shoe-repairing, is excluded here and is therefore also classified under "services".

The value of "services" calculated in this way is inflated somewhat beyond the true value of services currently produced, by the inclusion of rents of dwellings. (In some countries, where a dwelling is occupied by its owner and no cash rent is paid, a rent is "imputed" for national income purposes, and the national income total therefore includes a valuation of the whole annual income from this source.) Of these rents, a substantial part represents the cost of maintenance and necessary replacement of buildings, a true currently performed service; but the remainder represents interest on the capital value of past construction work. These figures, however, are not of a sufficiently high order of magnitude and do not appear to differ so much as between country and country, as to make it necessary to exclude them at this stage.

We may notice, finally, that the phrase " services " by no means implies that these are necessarily services rendered to the final consumer. A substantial part of the output of services, such as goods transport, maintenance of commercial buildings, provision of business telephone services, etc., are services rendered at early or intermediate stages of production, not to the final consumer. Even services such as passenger transport and hotel service, which appear at first sight to be services to the final consumer, may in effect be services rendered to business.

The measurement of the aggregate output of services, and the calculation of the average real product per man-hour of all those engaged in this sector of production, involves a straightforward but tedious rearrangement of figures available elsewhere in this book, and the detailed working need not be given. In effect, the procedure is to take net national product,[1] to exclude from it the element of imputation for the difference between wholesale and retail prices of farm produce consumed by farm families, and to deduct from it the net income produced by agriculture, foresty and fishing, by mining, and by manufacture. Net income produced by mining is taken at 80 per cent of gross income. In agriculture, precise figures of the difference between net and gross income are available for a certain number of countries ; for others, a deduction of 25 per cent is assumed (except that for Canada a figure is assumed similar to that of U.S.A.).

Figures of the labour force less unemployed, and of average hours, have already been given in Chapter III. The proportion engaged in agriculture, forestry, fishing and mining as shown in Chapter IX are deducted from these labour force figures and the residue multiplied by the average hours. From this is deducted the aggregate number of man-hours worked in manufacture as calculated

[1] It will be remembered that this may differ appreciably from the net national income for two reasons. (1) It excludes any investment income received from outside the country and excludes any such income paid outside the country. (2) The real value of the net national income may be considerably affected by changes in the terms of trade, whereas the effect of such changes is eliminated in the calculation of real national product.

TABLE I

		Real Product per Man-Hour in Service Industries	Real Net National Income per Head of Population in I.U. (from Chapter III)	Supply of Services per Head of Population per Annum in I.U.
Argentine	1951	0·475	363	225
Argentine	1935–38	0·234	230	127
Australia	1951–52	0·850	652	412
Australia	1935–38	0·623	485	276
Australia	1913–14	0·406	414	191
Belgium	1950–52	0·687	521	357
Belgium	1935–38	0·360	349	211
Brazil	. .	0·468	234	148
Canada	1950–52	1·442	846	637
Canada	1935–38	0·685	481	300
Chile	1950	0·409	266	190
Chile	1938	0·456	256	197
Colombia	1944–45	0·156	92½	50
Denmark	1950–52	0·654	618	446
Denmark	1935–38	0·605	563	384
Finland	1950–51	0·533	366	212
Finland	1935–38	0·425	265	127
France	1950–52	0·781	500	372
France	1930	0·473	371	207
France	1913	0·214	266	131
France	1861–65	0·131	136	73
France	1841–45	0·173	120	77
Germany	1953	0·498	446	271
Germany	1935–38	0·532	440	294
Germany	1925–29	0·375	303	208
Germany	1913	0·365	310	186
United Kingdom	1950–52	0·697	600	423
United Kingdom	1935	0·718	602	414
United Kingdom	1930	0·708	553	378
United Kingdom	1924	0·642	494	334
United Kingdom	1907	0·559	510	360
Hungary	1935–38	0·218	156	84
Ireland	1950–51	0·667	436	308
Ireland	1935–38	0·592	356	225
Ireland	1926	0·567	297	192
Italy	1935–38	0·347	170	98
Japan	1950–52	0·391	208	147
Japan	1935–38	0·255	223	142
Japan	1925–29	0·215	182	116
Japan	1913	0·174	146	99
Netherlands	1950–51	0·711	502	325
Netherlands	1935–38	0·528	437	260
New Zealand	1950	1·214	958	627
New Zealand	1935–38	0·788	723	401
New Zealand	1925–29	0·584	582	328
Norway	1950–52	0·530	481	263
Norway	1935–38	0·408	370	175
Peru	1950–51	0·247	140	100
Sweden	1950–52	0·868	638	462
Sweden	1935–38	0·392	427	191
Sweden	1925–29	0·355	327	167
Union of South Africa	1950	0·555	284	192
Union of South Africa	1935–38	0·347	200	111
U.S.A.	1950–52	1·477	1105	721
U.S.A.	1935–38	1·033	663	435
U.S.A.	1925–29	0·992	685	448
U.S.A.	1904–13	0·782	508	322
U.S.A.	1899	0·641	411	251
U.S.A.	1889	0·583	355	210
U.S.A.	1879	0·527	292	149

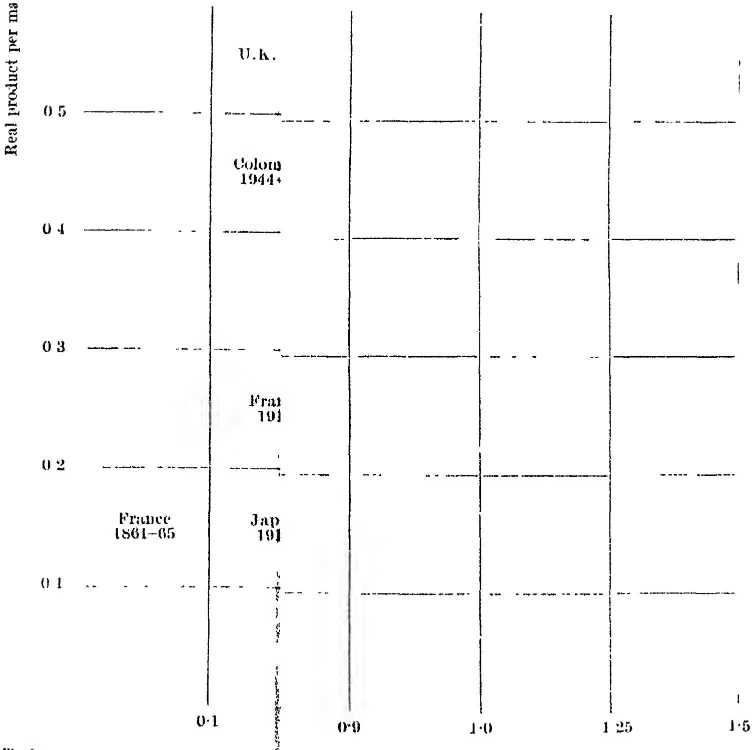
in Chapter VI, leaving a figure showing the aggregate man-hours worked in the service industries.

One further correction has to be made, namely for the net import or export of services as between countries, as shown by balance of payments statistics. These mostly consist of transport and banking and insurance services. International interest and dividend payments are not included here.

This deduction for imports and exports of services is made when we are computing the supply of services per head in each country (but not of course when we are computing productivity per man-hour of those engaged in the service industries).

The preceding table covers all the countries and periods for which data for real national product, agriculture and manufacturing output could be obtained to coincide.

It will be immediately noticed that real product per man-hour in services varies over a considerable range, which seems to be of a similar order of magnitude to that in manufacture. Table II compares the two productivities for different times and countries. It will be seen that high productivity in manufacture and high productivity in services generally go together, but that the data tend to spread out at the lower levels, in a manner which indicates that a moderately high productivity in services is sometimes associated with a low productivity in manufacture; or alternatively that sometimes (but not always) productivity in services advances more slowly than productivity in manufacture. It will also be noticed that deviations from the diagonal line into the S.E. part of the diagram (higher productivity in manufacture than in services) appear to be in newly developed countries, while the converse position is sometimes found in some of the older countries. If we make comparisons along horizontal lines we will see that British productivity in the service industries has generally been about equal to American productivity 20 years earlier; while if we make comparisons in the vertical columns we will see that British productivity

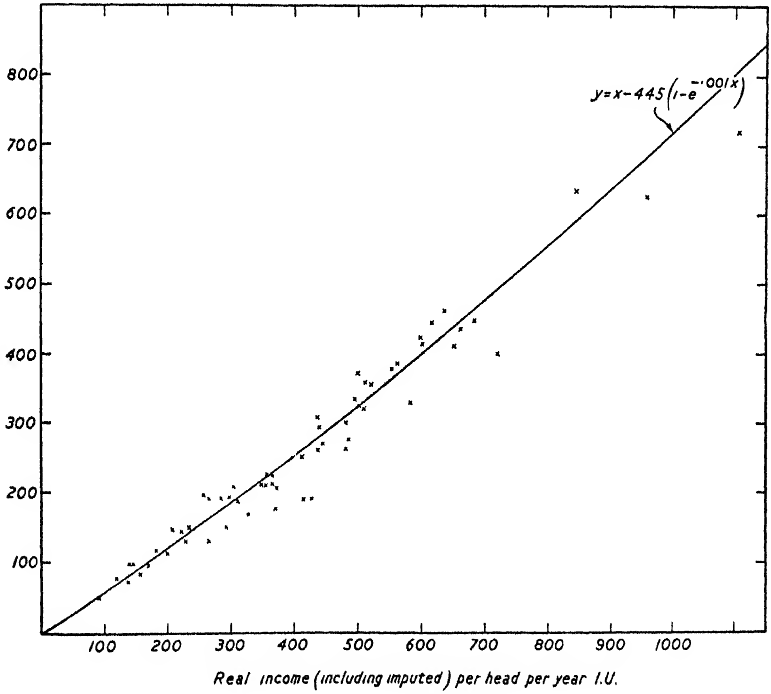


To face page 378]

in manufacture has resembled that of the United States some 40 years earlier.

The data for the supply of services per head of population, when plotted, are seen to be a fairly closely determined function of real income per head. A mathematical function is sketched in which appears to fit the data fairly well.

SUPPLY OF SERVICES AND HANDICRAFT PRODUCTION, EXCLUDING IMPUTED, INCLUDING NET IMPORTS OF SERVICES PER HEAD PER YEAR I.U.



The three isolated highest data for real income per head are those of the U.S.A., New Zealand and Canada respectively. In the U.S. in 1950–52 the demand for manufacture was probably kept abnormally high by the coincidence of boom conditions in the production of producers' and consumers' durable goods, and of heavy military orders; and this abnormal demand for manufacture, under

conditions of full employment, made the supply of services somewhat lower than it would have been under equilibrium conditions.

It follows from this that there is an asymptote to the demand for goods as such at about 445 I.U. per head. However high real income rises, the demand for goods will not exceed this figure, the rest of the income being spent on services. "Services" so defined already constitute over 70 per cent of income in U.S.A., and this proportion will gradually rise. If real income per year per person (total, not occupied population) rises to 2000 I.U. the proportion will rise to 81 per cent, at 3000 I.U. to 86 per cent.

It should be added that the word "goods", as here used, strictly means "net product of agriculture and manufacture", and "services" includes not only those consumed directly as such, but also transport, etc. used in agricultural and manufacturing production. (It should also be added that this figure of 445 I.U. should not be directly compared with the asymptotic demand for farm products of 114 I.U. given in the next chapter: for the latter is a gross figure, including manufactured goods and services used up in the course of farm production.)

One of the most important of the service industries is building and construction. Some figures for the long-period trend of productivity in England have already been given with manufacture in Chapter VI (for convenience; because building as well as certain manufacture was included by Jones in his study). It was there shown that "real cost" showed a moderate fall between 1851 and 1901, but only a further fall of 9 per cent between that date and 1939. (It must be remembered that "real cost" here does not mean quite what it generally means in other contexts; if, for example, the price of timber showed a heavy fall, and all other factors remained unchanged, Jones's formula would *not* show a fall in the real cost of building. His formula is a measure of the efficiency of labour and management, and of any economy or diseconomy in materials whose values are computed at standard prices.)

Other available data about building mostly take the form of costs, in money or in man-hours, per square foot or square metre of floor space constructed. These give a less satisfactory measure than Jones's index for three reasons: (1) They are affected by changes in the price of materials, which are outside the control of the building industry; (2) in comparisons between countries, they will be affected by the customary lay-out of towns — blocks of flats being more costly to construct per square foot of floor space than single-family houses; (3) as between different times or different countries, rising standards of comfort and efficiency may affect the index number, as distinct from genuine changes in prices.

Subject to these qualifications, Table III may be considered.

Our first task is to compare the trend of the British figures, 1842–1939, with those given by Jones. The upward trend of the cost per square metre, when converted to I.U. by the coefficient of the general purchasing power of money at each date, reflects the gradual improvement in the minimum standards of housing which custom or law will tolerate, and also for the period since 1900 some rise in the relative price of timber. Since 1939 there has been a definite deterioration in productivity per man-hour, on which the Girdwood Committee has forcibly commented in its reports to the Minister of Health. A similar deterioration, however, appears to have taken place in the U.S.A.[1] and more markedly in Germany. The scale of output of the building industry has been somewhat expanded in Britain and (for obvious reasons) very much more expanded in Germany, where the rate of house building, in relation to population, is 50 per cent higher than in Britain.

Building appears to be a genuine "Diminishing Returns" industry. The available supply of skill, both manual and managerial, is very limited, and cannot be rapidly enlarged, and therefore any expansion of the scale of the industry

[1] "Building labour today produces only 81 per cent of what it effectively produced in 1941" (*Fortune*, Jan. 1950).

involves employing men of strength or skill below the previous average, and there appear to be no appreciable economies of large-scale organisation to off-set this. This

TABLE III

CONSTRUCTION COSTS OF HOUSES

Country		Source of Information	Per sq. metre (10·76 sq. ft.) Cost in National Currency	Cost in I.U.	Cost in Man-Hours Direct Labour (not Materials)
Germany	1913	*Wirtschaftsdienst*, Jan. 1953	96	36·4	..
	1936	Do.	126	43·9	..
	1950	Do.	236	47·2	..
	1952	Do.	300	54·6	..
Great Britain	1842	Hammond, *The Bleak Age* *	2·4	20·7	..
	1900	Rea, *How to Estimate*	2·7	26·3	..
	1938–39	Ministry of Health, *The Cost of House Building* †	5·4	29·3	21·9
	1947	Do.	13·0	35·6	31·7
	1949	Do.	13·8	34·6	25·9
	1951	Do.	15·2	33·2	25·9
France	1950	Bénard, Institut National des Études Démographiques, *Cahier* 17, p. 76	25,000	57·3	..
U.S.A. ‡	1948	*Monthly Labour Review*, Dec. 1948			
		Wooden houses	..	..	14·0–15·1
		Brick or concrete houses	..	..	20·0–13·6
		Stucco houses	..	..	9·7–13·0
	1925	F. W. Dodge Corporation, Residential Contracts Awarded	52·9	47·5	..
	1939	Do.	43·1	48·1	..
	1948	Do.	83·7	50·8	..
	1953–54	Do.	103·5	56·4	..
India	1947	Farm College, Allahabad (private communication) §	59	11·0	..

* Back-to-back houses in Manchester, covering 144 square feet, apparently on three storeys, and costing £96.

† For a house of post-war (not pre-war) standards of construction, of 934 square feet plus 95 square feet of outbuilding. Costs are reckoned per square foot of total space including outbuilding. Costs exclude land, roads and architects' fees.

‡ Data given per house — assumed average size 100 square metres. The first figure represents the cost of a house built singly, the latter in blocks of 25 or more.

§ American style residence.

is seen from the figures of cost when housing contracts are let in larger blocks. In the United States there is a fall in the real cost of brick or concrete houses, but a rise for

timber or stucco houses. In Britain the Girdwood Committee Report shows that, if houses are contracted for in blocks of 40, the saving is only $1\frac{3}{4}$ per cent, as compared with contracts for blocks of 4. Furthermore, we must remember that the number of contractors capable of managing large jobs is limited, and that even the small savings which can now be obtained from letting out a few large jobs probably would not prevail if the scale of the industry were expanded all round.

Even after this recent rise, the real cost of house-building in Britain is lower than in most other countries. This reflects, in the first place, the prevalence of the single-family house as opposed to the more expensive block of flats. The man-hour figures approximately confirm the statement by the Anglo-American Council on Productivity [1] that real product per man-hour in American building was $1\frac{1}{2}$ times British. For the real national product as a whole, however, American productivity per man-hour is now about $2\frac{1}{4}$ times British. We should therefore expect the real cost of building, expressed in I.U. per square metre, to be about 50 per cent higher than in the United States, as it is.

A curiously similar result is obtained by comparing France in the two years 1914 and 1939.[2] Between these years the general price-level rose 7-fold and the general wage-level 12-fold. Relative to other prices, the price of building rose by 40 per cent, while the wages of builders fell 3 per cent, relative to wages in general. Allowing for the fact that building costs include the value of materials, the real cost of building work seems to have risen some 75 per cent relative to other real costs. Over this period, real net product per man-hour appears to have risen nearly $2\frac{1}{2}$-fold. The increases in real net product per man-hour in building is therefore deduced at 40 per cent.

It appears that we can make a definite generalisation that while the efficiency of labour in building may improve with time, it almost invariably comes more slowly than in

[1] *Economist*, 6th May 1950.
[2] Sauvy, *International Labour Review*, April 1947.

production as a whole, whether through time in one country, or when comparing a more productive with a less productive country. In the table, the lowest figure is clearly India, followed by that of early nineteenth-century England. The relative cost of building, that is to say the quantity of other goods which have to be exchanged for a unit quantity of building, shows a persistent tendency to rise.

It appears that these considerations do not apply in civil engineering. The index number of costs of road construction in the United States prepared by *Engineering News Record*, divided by average wages per man-hour to obtain the trend of man-hour costs, showed an improvement at the rate of 3·2 per cent per annum between 1922 and 1941, a considerably more rapid rate of advance than that of real product per man-hour in the economy as a whole. In this sphere, of course, a good deal more mechanisation is possible.

There is, of course, a general tendency for several services to be relatively cheaper in less economically developed countries or periods. Thus Professor Fourastié[1] gives the following comparisons:

TABLE IV

	Price in Francs, 1949	Number of Francs needed to give the same Purchasing Power as $1
Official exchange rate	..	349
Bicycle	1500	375
Low horse-power car	4500	250
Haircut	60	60
Orchestra stall in theatre	450	45

Professor Fourastié followed up the interesting problem of the price of a haircut, and found that alike in Moscow, Rome, Paris and Chicago it amounted to between $\frac{3}{4}$ and 1 hour's wage of an unskilled manual worker.

[1] Paper published by Commissariat Général du Plan, 15th March 1930.

On the other hand, as an example of a service which has now become relatively cheaper as it has been organised on a larger scale, he found that the cost of developing and printing a set of photographs now only requires some 40 per cent of the man-hours that it required in 1910 or two-thirds of the man-hours that it required in 1920.

Real product per person engaged in telephone services in U.S.A. was rising at the rate of only 0·9 per cent per year between 1917 and 1929 (when most of the service was still manual) but the rate accelerated to $2\frac{1}{2}$ per cent per annum between 1929 and 1939.[1] Real product per man-hour, as opposed to man-year, probably increased rather faster than this. On the other hand, since 1940 there has again been a deceleration, presumably owing to increasing congestion. Between 1940 and 1948, on the Bell system (which represents about 90 per cent of the U.S. telephone traffic) the number of employees increased 103 per cent, while the number of 'phones increased 79 per cent, the number of local calls 56 per cent and the number of toll and long-distance calls 114 per cent.

In electricity generating the rate of improvement of real product per man-hour, between 1902 and 1937, was as high as 4·7 per cent per annum,[2] but since 1937 the rate has decelerated to 3·0 per cent per annum.

We may now examine costs and efficiency in retail distribution.

For a number of important foodstuffs the physical efficiency of distribution can be measured, at various dates, by the gross money difference between wholesale and retail prices, or in some cases between prices received by the farmer and the price paid by the consumer. All these money costs are converted into I.U. by the general coefficient for the purchasing power of money at each date.

It will be seen that this method of conversion, in effect, measures the cost of distribution as depending upon a composite of two factors. (1) Whether the quantities of

[1] Weintraub and Magdoff, *Econometrica*, October 1940.

[2] S. Fabricant, National Bureau of Economic Research, *Occasional Paper* 7.

various kinds of labour and materials used in the distributive process have changed, or are changed more or less rapidly than changes in the productivity of the home economy. (2) Whether the relative remuneration of these factors has risen or fallen relative to other remunerations.

If the cost of distribution, in I.U. per hundred kilos, remains constant, this means, in general, that the efficiency with which the commodity is being distributed is advancing at about the same rate as the efficiency of the economy as a whole (and that the remuneration of labour and effort in this branch of distribution is not changing relative to other remuneration elsewhere).

In the packing and distribution of bread, the first outstanding feature is the very high relative level of costs in U.S.A. and Canada, perhaps due to some other curious ingredient mixed in the bread, which gives it so odd a flavour by European standards, or to the elaboration of distributive services. The very low cost in one of the poorest areas in southern Italy is noticeable. Otherwise, there is a considerable uniformity between countries.

For potatoes also costs of distribution in U.S.A. and Canada are noticeably high. This may be due to their being grown in a few specialised areas, involving considerable transport costs and wastage when they are distributed over the whole country. A great improvement in relative efficiency of distribution is noticeable in Great Britain.

For butter, cheese and eggs the figures seem to be extraordinarily erratic and further study is obviously required. In Britain there is evidence of a great improvement since 1900. The introduction of refrigerators, and increased competition by chain stores and co-operatives, are both possible factors.

In milk, the real costs of distribution are outstandingly low in Austria, Finland, France, India and Switzerland. For Britain figures are available over a century, and show a deterioration in relative efficiency up to the 1920s, followed by a relative improvement since.

PRODUCTIVITY OF SERVICE INDUSTRY.

In the distribution of meat,[1] the costs are outstandingly low in Australia and South Africa, where the meat industry has been highly organised, with centralised abattoirs, to serve an export market. The costs of meat distribution in U.S.A. are relatively high, and up to 1935 were showing a rising trend relative to costs in other industries, but have since been reduced.

The real costs of distributing fruit and vegetables are dealt with in Table VI. There are no other commodities for which the costs of distribution are so important; they may amount to two-thirds of the price paid by the consumer. Owing to the perishable nature of the goods, there

[*contd. on p.* 390

[1] A more recent study by Mr. S. A. Bradburn (*Farm Economist*, 1954) computes "slaughtering margins" for beef *before* crediting the value of the by-products in Great Britain as follows (in I.U. per 100 kilos):

1920–24	5·4
1925–29	5·3
1930–34	5·6
1935–39	5·0

The general trend is stationary, but within each quinquennium there are considerable fluctuations.

By 1948–49, under the centralised marketing and slaughtering arrangements of the Ministry of Food, the figure had been reduced to 3·95. In Queensland, where slaughter is concentrated in very large abattoirs, the figures (also *before* crediting by-products) stood at:

1932	2·79
1939	2·50
1951–52	2·36

(The last two years are averaged because in one the seasonal conditions were much better than the other.)

Mr. Bradburn found retailers' margins, in I.U. per 100 kilos, to be:

1925	15·5
1930	22·9
1938	22·6
1939	20·6

These seem to be well above those prevailing before this period (in 1923) or after (in 1944).

Mr. Bradburn found the retail margin in 1925 to be 3·4d. in an average retail price of 14·0d., or 24 per cent. The Linlithgow Commission found the gross margin of a retailer in 1922, buying his meat ready slaughtered, to be only 16·3 per cent for private traders and 21·3 per cent for co-operatives. The gross margins of master butchers doing their own slaughtering were only fractionally higher, the proceeds from the hides and by-products practically offsetting the slaughter costs. Between 1913 and 1922 there was practically no change in the relative margin of master butchers, implying that their costs rose in about the same proportion as the price of meat (about 72 per cent wholesale).

	New York, 1939–40, Retailing Costs Only (Cornell University Agriculture Experiment Station *Bulletins*, 815, 820)			Element of Above Costs Accounted for by Spoilage			Vienna, Retailing Costs Only	
	Shops	Push-cart and Market Stalls	Wagon and Motor Hucksters	Shops	Push-cart and Market Stalls	Wagon and Motor Hucksters	1929–31	1934–36
Apples, local	4·2	3·0	2·4	0·5	0·2	0·3	4·5	3·0
Apples, transported long distance	5·4	2·7	5·7	0·7	0·6	0·4	..	..
Apricots	..	..	..	..	..	..	7·7	4·4
Avocados	14·5	..	..	2·3	..	..	..	..
Bananas	1·0	1·8	2·4	0·8	0·4	0·6	..	..
Cantaloupes	2·4	2·0	1·5	1·0	0·6	0·6	..	..
Cherries	..	..	..	..	..	..	6·2	4·4
Cranberries	8·8	7·9	6·0	0·1	..	..	..	..
Grapefruit	3·4	1·8	2·2	0·6	0·3	0·6	..	..
Grapes, local	2·2	0·7	9·8	0·4	0·7	0·9	..	..
Grapes, transported long distance	6·7	3·4	2·4	2·0	1·1	0·7	..	..
Melons	7·6	2·2	2·2	2·0	0·6	0·7	..	..
Nuts	..	..	..	..	..	..	7·8	5·1
Oranges	3·3	2·0	2·8	0·7	0·4	0·3	..	..
Peaches	3·4	2·2	2·2	1·2	0·6	0·1	..	..
Pears, local	3·8	1·5	2·4	0·7	0·1	0·3	5·0	3·3
Pears, transported long distance	4·8	3·3	3·1	0·7	0·6	0·7	..	..
Pineapples	3·4	3·0	3·9	0·7	0·3	..	..	..
Plums, local	..	..	..	..	..	..	4·2	2·3
Plums, transported long distance	11·5	3·7	..	3·4	2·5	..	..	..
Strawberries	10·9	12·1	..	3·7	..	..	..	..
Tangerines	5·7	3·0	3·9	1·2	0·4	0·3	..	..
Water melons	1·8	2·2	0·7	0·3	..	0·7	..	..
Artichokes	..	..	..	..	..	..	..	..
Beans, early	..	..	..	..	..	..	..	..
Beans, main crop	..	..	..	..	..	..	..	..
Beetroot	..	..	..	..	..	..	..	..
Cabbage	..	..	..	..	..	..	1·3	1·2
Carrot	..	..	..	..	..	..	..	..
Cauliflower	..	..	..	..	..	..	2·7	2·1
Cucumber	..	..	..	..	..	..	4·2	3·3
Lettuce	..	..	..	..	..	..	..	..
Onion	..	..	..	..	..	..	..	..
Parsnip	..	..	..	..	..	..	..	..
Peas	..	..	..	..	..	..	..	..
Rhubarb	..	..	..	..	..	..	..	..
Seakale	..	..	..	..	..	..	..	..
Spinach	..	..	..	..	..	..	4·0	2·6
Sprouts	..	..	..	..	..	..	..	..
Tomatoes	..	..	..	..	..	..	..	..

U.S. Data for Other Years

Costs, Farm to Consumer

	1920	1929	1935
Oranges	4·4	4·0	3·7
Cabbages	8·7	7·4	8·4

Fruit and Vegetables

100 Kilos

Netherlands, 1931		Australia (Brisbane) 1939, Retailing Only	Britain, 1923, Linlithgow Commission, Retailing Only			Britain, 1944	Italy, 1953–54		
Retailing Costs Only	Total, Farm to Consumer		High-class Shops	Other Shops	Markets and Coster-mongers	Review of Farm Costs, Marketing and Agricultural Economics, Farm to Consumer	Farm to Whole-saler	Of which Transport Farm to Ware-house	Retail-ing
..	..	4·4	41·0	23·3	..	11·5	3·8	1·0	3·6
..	..	..	..	..	..	..			
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	8·1
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	2·8	..	..	..	8·5	4·9	1·2	4·9
..	..	..	..	..	..	..	..	..	..
3·7	5·7	1·7	..	..	..	..	..	..	5·2
..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
6·5	10·5	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	3·6	1·1	3·9
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	1·0	0·2	1·2
16·3	21·6	..	..	..	..	..	..	..	..
5·2	7·6	3·8	..	..	..	19·8	..	..	5·4
..	..	..	2·8	2·8	..	..	..	..	3·6
..	..	1·2	2·0	1·5	1·0	3·7	..	..	1·8
..	..	..	2·8	2·8	2·1	5·9	..	..	..
3·7	6·6	..	..	..	..	..	..	..	2·7
..	..	..	..	..	..	..	..	..	..
1·3	1·7	3·4	..	..	..	..	..	..	..
..	..	..	4·0	4·0	1·8	5·7	..	..	..
..	..	..	5·0	2·9	2·9	..	..	..	..
..	..	7·6	..	..	..	15·7	2·4	0·7	3·6
2·2	3·6	..	..	..	..	..	..	..	..
..	..	..	58·5	19·0	..	..	..	..	..
2·3	4·1	..	..	..	..	..	..	..	..
..	..	..	10·0	5·6	3·4	..	..	..	..
..	..	5·0	..	..	..	12·0	..	..	16·5

is considerable spoilage which the distributor naturally seeks to recover by increasing his margin. In Table VI it will be seen that a very large proportion of the entire cost of distributing bananas, for instance, arises out of spoilage, a lower proportion in other fruits and vegetables. In Britain the Linlithgow Commission estimated that the over-all average rate of spoilage in the fruit and vegetable trade was $4\frac{1}{4}$ per cent—only $2\frac{1}{2}$ per cent in co-operative stores. The comparatively low level of this figure may be explained by lower summer temperatures.

TABLE VII

PERCENTAGE OF FRUIT AND VEGETABLE TRADE PASSING THROUGH DIFFERENT NUMBERS OF INTERMEDIARIES, GREAT BRITAIN

Type of Distribution	Linlithgow Report, 1923		Jefferys, 1938
	Grown near Consumption Centres	Grown in Specialist Growing Areas	
Grower to consumer direct	8	..	8–13
Grower, retailer, consumer	60	3	
Do., plus one further intermediary	22	42	42–51
Do. two further intermediaries	8	29	29–35
Do. three do.	1	20	9–13
Do. four do.	1	6	

Both in Britain and U.S.A. the lower costs of distribution through stalls and barrows are noticeable, and the additional costs incurred in "high class" shops.

Unusual and expensive fruits and vegetables cost more to distribute, probably because of the limited market and the greater risks involved. The outstanding figures in the whole of Table VI are for the costs of distributing that curious winter luxury vegetable, seakale.

The Linlithgow Commission in 1923 found the organisation of fruit and vegetable distribution in Britain very defective. The Commission prepared Table VII which appears to indicate a certain amount of unnecessary handling. It can be brought up to date with figures published by Mr. Jefferys in his study on retailing.

The following table compares the structure of costs for three products in Britain in 1923 and 1938 with a general average for New York in 1936. In spite of the vastly greater distances involved, transport represents a smaller proportion of the retail price in America than in Britain. Commission and other selling costs before the produce reaches the wholesaler are also much larger in Britain than the net receipts of the " jobber " in New York. One of the main differences appears to be that of wholesalers' profits.

TABLE VIII

	Prices and Costs in Pence — Britain, 1923			Average Composition of Retail Price of Fruit and Vegetables sold in New York, 1936. (Cornell University Agriculture Experiment Station *Bulletin*, 721)	Do. for Britain 1938 (Jefferys)
	Tomatoes, Early, lb.	Tomatoes, Main Crop, lb.	Cucumbers, each		
Grower's price	5·03	2·94	4·23	39½	47
Commission	0·60	0·37	0·50	3¾	4
Transport	0·16	1·02	0·17	13	5
Other selling costs	0·21	0·67	0·10	..	3
Wholesaler's buying price	6·00	5·00	5·00	56¼	59
Carriage	1·19	0·75	0·70	4¼	2–9
Other wholesaler's costs	0·75	0·16	0·45	2¼	..
Wholesaler's profits	2·06	1·09	0·67	..	..
Wholesaler's selling price	10·00	7·00	6·92	62¾	67 *
Retail selling price	15·00	10·00	10·00	100	100

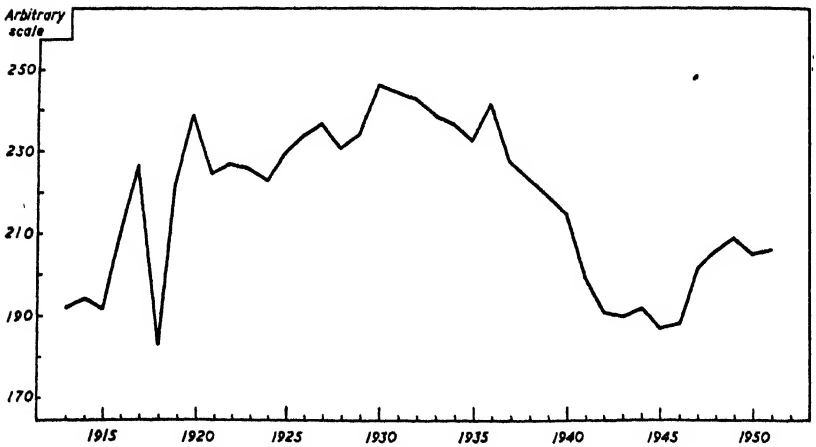
* Spoilage or deterioration of goods after they have been purchased by the retailer are estimated to represent a cost equivalent to 6 per cent of the retail price, or 18 per cent of the retailer's gross margin.

The wholesaling firms concerned in New York paid their executives an average weekly salary of $92, their salesmen $56, their porters and clerks $38. Presumably the turnover per person engaged was much more rapid than in Britain.

For a few countries calculations are available of the aggregate cost of distributing foodstuffs. In some cases economies in the real cost of distributing one foodstuff reached the consumer in the form of a lower price of another, as for instance when commodities like sugar are used as " loss leaders ". This aggregate is therefore more significant than a selection of individual items.

The U.S. Department of Agriculture has calculated, since 1913, the total cost, between farm and consumer, of distributing a representative "basket" of foodstuffs. Multiplying the figure for each year by the purchasing power of money in that year, we can estimate the trend of real costs. For the first part of the period they rose (i.e. efficiency in distribution did not keep pace with the rising efficiency of the economy as a whole) to a clearly marked peak in 1930. From that point, with the pressure

FARM TO CONSUMER COSTS OF DISTRIBUTION IN U.S.A. CONVERTED TO I.U.



of competition in the Depression, and the introduction of self-service stores, real costs fell rapidly. During the war years they were reduced still further by reductions in the services given to customers, and since 1947 appear to have been approximately stabilised at almost the same level as in 1913, i.e. the long-period trend in the efficiency of distribution has been the same as for other industries.

For Britain the evidence is not at all clear; but by a comparison of wholesale and retail prices, as published by the Board of Trade and Ministry of Labour, it appears

that efficiency in distribution, between 1900 and 1933, was increased much faster than in the economy as a whole.

In Australia the gross distributive margin on a representative basket of foodstuffs has also been calculated over a fairly long period, and that converted to I.U. shows approximate stability.

Real Costs of Distribution in Australia, Arbitrary Units

1901–4 . .	7·1
1913–14 . .	6·0
1915–19 . .	5·0
1920–24 . .	6·8
1925–29 . .	7·4
1930–34 . .	7·0
1935–38 . .	7·2

For Canada some recent data are published in *Economic Analyst*, August 1954, from which it appears that the distribution costs of a basket of foodstuffs, converted to I.U., have remained constant between 1945 and 1953, i.e. efficiency in distribution has risen at just the same rate as elsewhere.

In examining costs of food distribution, however, the following table, published in the *Monthly Labour Review* of March 1939, may be useful. It shows, in cents per week, the components of the food consumption of a representative

TABLE IX

	Total	Dairy Produce and Eggs	Flour, Bread and Cereals	Meat and Fish	Canned Goods	Fresh Fruit and Vegetables	Beverages, Seasoning and Dessert
Received by :							
Farmers and other primary producers . . .	456·5	105	32	197	36·5	44	42
Transport agencies . .	81·0	11	11	21	5·5	31	10
Brokers and agents .	28·5	1	4	6	4·0	2	3
Processors, assemblers and packers . . .	340·0	62	57	56	93·0	21	51
Wholesalers . . .	72·0	13	6	22	14·0	6	11
Retailers . . .	272·0	31	25	106	33·0	47	30
Total . . .	1250·0	223	135	408	186·0	151	147

family of four with an income of $2100 per year. Of the total family expenditure on food, only a little over one-third is received by farmers.

Professor Sauvy in *Richesse et population* has compared changes in the numbers engaged in the distribution of textiles and clothing in France, with the volume of textile production taken as indicative of the volume of output in the clothing industry.

TABLE X

EFFICIENCY IN DISTRIBUTION (1896 = 1)

	1896	1906	1921	1931	1936
Numbers engaged	1·0	1·14	1·42	1·85	1·74
Quantity of goods distributed per man-year	1·0	0·91	0·63	0·59	0·64
Quantity of goods distributed per man-hour	1·0	0·95	0·77	0·76	0·83

In the distribution of tobacco, on the other hand, the quantity distributed per man-year rose 78 per cent between 1896 and 1931. This, perhaps, can be explained by the fact that tobacco is a State monopoly.

Certain information has been collected regarding the average efficiency of shops of different sizes. Sometimes the figures show an optimum. Thus, for instance, Professor Joel Dean (Chicago University, *Studies in Business Administration*, vol. xii, No. 3) finds costs per unit in shoe stores fall to a minimum of $0·6 per pair at about 1300 pairs per annum and remain constant at higher sales. In the grocery trade, analysis of the reports of a number of stores controlled by an important English co-operative society within one city in 1936 is shown in Table XI.

A steady fall in cost as the size of the business increases is revealed by these figures, and for the stores doing the most business the low cost ratio of 10·1 per cent was established. One is almost tempted to say that the economies of large scale in retailing are more marked than they are in manufacturing. The steadiness of the fall in costs with increasing size of business is quite remarkable,

though it must be noted that we are here dealing with the distribution of groceries which are comparatively standardised goods.

TABLE XI

Average Turnover £ per Week	Costs (including Interest but excluding Profit) as Percentage of Turnover
100–200	13·21
200–300	11·51
300–400	11·13
400–500	10·50
500 upwards	10·08

Dutch figures on the other hand lead to quite a different result. Figures for grocery stores in 1941–42[1] show a low cost for the very small businesses (presumably run by part-time labour) and then another minimum, at a much lower

TABLE XII

Turnover £ per Week	Costs as Percentage of Turnover
Under 20	13·8
20–30	19·3
30–40	17·1
40–50	14·7
50–60	15·2
60–70	14·0
70–80	13·7
80–100	13·1
100–120	14·2
120–140	15·4
Over 140	14·8

turnover than the English. The levels of turnover should be approximately comparable with English figures for 1936. For convenience a turnover of 1000 guilders per year has been equated to £2 per week. Costs in each case include imputed wages for the work done by the proprietor and his family.

[1] Quoted by Dr. Bakker, *Statistiek*, vol. iii.

In the case of butchery it was possible to obtain interesting comparisons relating to costs per unit of turnover in shops of different size in England and Holland. The English figures related to butcheries owned by co-operative societies and included manager's salary and interest in the costs in each case. In the Dutch figures[1] a careful allowance was made for the services of the proprietor and his family on the basis of an estimate of what their wages

TABLE XIII

COSTS AS PERCENTAGE OF TURNOVER IN BUTCHERY

<table>
<tr><th>Turnover £ per Week</th><th>Netherlands, 1932</th><th>Labour Costs included in Previous Column</th><th>English Co-operative, 1936</th><th>Linlithgow Report,* 1924</th></tr>
<tr><td>Under 20</td><td>39·2</td><td>23·3</td><td>..</td><td rowspan="4">25·0</td></tr>
<tr><td>20–30</td><td>31·6</td><td>19·5</td><td>..</td></tr>
<tr><td>30–40</td><td>26·0</td><td>16·0</td><td>..</td></tr>
<tr><td>40–50</td><td>25·4</td><td>16·0</td><td>..</td></tr>
<tr><td>50–60</td><td>22·7</td><td>14·1</td><td>18·4</td><td rowspan="4">17·5</td></tr>
<tr><td>60–70</td><td>21·2</td><td>12·9</td><td>18·9</td></tr>
<tr><td>70–80</td><td>22·1</td><td>13·8</td><td>15·9</td></tr>
<tr><td>80–100</td><td>21·2</td><td>13·8</td><td>15·1</td></tr>
<tr><td>100–150</td><td>17·9</td><td>10·4</td><td>15·0</td><td rowspan="2">15·5</td></tr>
<tr><td>150–300</td><td>14·0</td><td>8·5</td><td>13·4</td></tr>
<tr><td>300 and over</td><td>..</td><td>..</td><td>..</td><td>12·6</td></tr>
</table>

* Manager's salary only given for shops over £300 per week. Assumed £5 per week for shops under £100 per week, £8 for shops £100–£300.

would have been if they had gone out to work. The Dutch figures relate to 1932 and the English figures to 1936, converted at the 1936 rate of exchange. Though the relation is by no means precise, it was found that a Dutch guilder in 1932 purchased approximately the same quantity of meat as could have been obtained with the equivalent amount of English money spent in England in 1936.

In U.S.A. the sales of groceries and meat are generally combined and the Dun and Bradstreet Retail Survey of

[1] *Butchery Costs in Utrecht, Maastricht and Schiedam.* Report compiled by Economisch Instituut voor den Middenstand.

1937 found the following percentages of costs (including an imputed salary to the proprietor) to turnover :

TABLE XIV

Turnover $ per Annum	Cities under 20,000 Population	Cities 20,000–100,000 Population	Cities over 100,000 Population	All Cities
Under 10,000	..	..	..	17·1
10–20,000	16·8	..	..	..
20–30,000	14·8	..	15·5	..
30–50,000	16·1	17·5	16·7	..
50–100,000	16·5	16·8	18·1	..
Over 100,000	14·8	15·8	..	..

Unlike the English figures, these show no clear trend by size.

A study for 1930 by the U.S. Census Bureau[1] showed, as might have been expected, that there was a sharp turning-point in costs at the figure of about $10,000 per annum. Stores selling groceries and meat with a turnover below this figure had operating expenses as high as 26 per cent of turnover, whereas the general range stood at about 14 per cent and did not fall appreciably even at very high levels of turnover. For drug stores the corresponding figures were 55 per cent and 30 per cent, except for very small towns with under 5000 population, where the corresponding figure stood at 37 per cent and 25 per cent.

The Linlithgow Commission found the following for fruit and vegetable shops in Britain in 1923 :

TABLE XV

PROFITS AND COSTS AS PERCENTAGE OF TURNOVER

	Private	Co-operative	Under £200 per Week	Over £200 per Week
Gross Margin	20·7	19·3	20·3	20·8
Wages	9·3	9·6	5·4	10·1
Rent, rates and light	3·1	4·1	2·7	3·2
Other costs	3·5		3·8	3·5
	4·9	5·5	8·3	4·1

[1] Quoted in *Cost Behaviour and Price Policy*, pp. 256-7.

The net profit shown in the first column is too low, as taxation statistics show an average profit of 6·0 per cent on turnover for 1922.

When considering the approximate equality of gross margins shown in the first line, we must remember that the same goods were probably sold at lower prices in the larger shops and in co-operatives.

These figures give no clear indication of the optimum size of shop in this trade.

The census of the retail distribution of clothing for Britain in 1942, taken by the Board of Trade, brought some interesting information to light.[1]

TABLE XVI

Turnover per Annum	Number of Shops, thousands	Staff, thousands	Do., per Shop	Sales of Clothing, £ million	Sales of Other Goods, £ million	Sales per Head of Staff
Less than £2500 .	37·0	70·0	1·89	60	5	930
£2500–£5000 .	13·0	40·0	3·07	45	5	1250
£5000–£10,000 .	7·5	40·0	5·33	50	5	1375
£10,000–£100,000	6·0	92·5	15·4	100	25	1352
Over £100,000 .	1·5	180·0	120·0	120	110	1275
TOTAL .	65·0	422·5	6·5	375	150	1241

It is not clear whether the staff column includes proprietors. If it does not, sales per person engaged in the smaller shops will be less than is indicated in the last column. Even so, the indications are that the comparatively small shop is highly efficient. As the shop becomes

[1] Further information on costs and margins was as follows:

	As per cent turnover
Wages and salaries	13·0
Rent, rates, occupancy costs . .	4·5
Other expenses	4·5
	22·0
Gross margin	27·85
Discounts	1·65
	20·5
Net margin	7·5

larger, it trades more and more in miscellaneous goods, calling itself a Department Store, and often incurring very heavy overhead expenses.

Dr. Bakker's results for the Netherlands show efficiency rising to a maximum at about the same point.

TABLE XVII

DRAPERY STORES, 1937

Turnover per Year	Sales Guilders per Man-Hour
Under £1000	2·20
£1000–£2000	2·14
£2000–£3000	2·32
£3000–£4000	2·60
£4000–£5000	2·58
£5000–£6000	2·25
£6000–£7000	3·21
£7000–£8000	2·36
£8000–£9000	3·60
£9000–£10,000	2·93
£10,000–£20,000	3·14
£20,000 and over	3·70

In the analysis of department store accounts there seems to be some difference between American and British results. American figures show little evidence of increasing sales per employee as the size of business increases, whereas with the British figures there is such evidence. There is no doubt that, as the size of business increases, there is an increase in sales per *selling* employee; the question which arises is whether this gain is offset by the increasing overhead costs of the big business.

In a recent study by Lady Hall [1] it is shown that the volume of goods handled per person engaged in U.S. retailing is about twice the British figure. In different trades the ratio ranges from 1·7 to 3·5, but these results

[1] *Economic Journal*, March 1955.

do not appear to be functionally linked with the *per capita* sales volume.

There is another point which is perfectly clear, that the higher the proportion of cash sales, the lower the costs to a remarkable degree. Credit trading is a very costly operation; this seems to be one of the cases where the costs are not fully borne by those who incur them.

Recently a detailed study has been made in France[1] of the costs of coal distribution. In I.U. terms these have all been immensely reduced, i.e. efficiency in distribution has increased much more rapidly than in the rest of the economy. The data are given in detail and it is possible to exclude sales taxes and railway freights, charges for which the distributive trade is not responsible. Measured in I.U. per metric ton, the cost stood at about 9 in both 1929 and 1938, but since the war has been reduced to 5.

It is going to be a difficult matter to secure the two optima — the optimum size and the optimum number of businesses in retail distribution. It is generally held that the existence of too large a number of shops, not efficiently conducted or below optimum size, reduces the efficiency of the distributive trades as a whole.

The Linlithgow Commission wrote: "There remain a large proportion of small establishments, the excessive costs of which, in the long run, render them powerless to provide the real and effective competition capable of reducing margins. They are not an unmixed blessing to the consumer. Many of them are too small and inefficient to render the public the services desired, except on wide margins which, though not more than sufficient to enable the establishments to pay their way, prevent them from being a check on larger and more efficiently managed concerns."

Messrs. Weintraub and Magdoff (*Econometrica*, October 1940) write thus:

"The highly competitive conditions which prevail in

[1] *Études et Conjuncture*, July 1954.

these industries (wholesaling and retailing) and the small amount of money which suffices to set up a store, result in a rapid influx of new enterprisers who just as rapidly drop out again but who have meanwhile operated at a loss, have conducted an inefficient business, and thus contributed toward keeping down the level of productivity of the industry as a whole.

"Some of the persons absorbed must be regarded as having assumed a status of disguised unemployment, judging from the higher rates of mortality of establishments engaged in retail trade and the incomes of large sections of the small business men."

It certainly does not follow from this that restrictions should be placed upon entry into retail distribution either by law or by commercial pressure. For the persons excluded might be (and in all probability would be) just those active and enterprising persons who would vigorously compete. On the other hand, this state of affairs may be taken as an indication that manufacturers should discontinue their policy of "retail price maintenance", or refusal of supplies to any retailer who cuts retail prices. This policy was apparently designed with, amongst its other objects, the purpose of attracting larger numbers of less qualified people into retail distribution.

The rate of failure of small businesses, with all the loss and distress thereby occasioned, is fearfully high.

"Business deaths have varied from 250,000 to 450,000 establishments annually since 1900, while from 300,000 to 500,000 new business enterprises have been launched each year in the U.S. during the same period . . . new businesses . . . start in a ratio of about 1 : 5 of concerns in existence." (U.S. Senate Committee Print No. 13, *Small Retailers Face the War*, September 1942.)

This ratio is analysed in more detail by a paper published in *Survey of Current Business*, December 1945, showing the percentage of all 1944 firms discontinuing business within one year. The data were obtained from Bureau of Old Age Insurance and do not include firms without employees. The worst casualty rate, it will be

seen, is in cafés, filling stations and amusement enterprises.

	Per Cent
All industries	16·1
Mining and quarrying	23·7
Contract construction	14·9
Manufacturing	12·1
Transport, communication and public utilities	13·5
Wholesale trade	5·8
Retail trade	21·7
General merchandise	11·7
Food and liquor stores	14·2
Grocery, with and without meat	15·1
Meat and sea-food	12·7
Other food and liquor stores	13·1
Automotive	14·4
Automobile dealers (new and used)	17·0
Other automotive	8·7
Apparel	9·6
Apparel and accessories	9·8
Shoes	7·6
Eating and drinking places	37·2
Filling stations	39·2
Other retail trade	11·0
Home furnishings	5·2
Appliances and radio	9·8
Drugs	17·1
Hardware and farm implements	5·4
Miscellaneous retail trade	12·7
Finance, insurance and real estate	7·1
Service industries	15·9
Hotels	20·7
Personal service	16·3
Laundries, cleaning and dyeing, and repair shops	16·5
Barber and beauty shops	19·8
Other personal services	10·5
Business services	6·9
Automobile repair	14·6
Miscellaneous repair	12·5
Amusements	29·9

A study was made by Hutchinson and Newcomer[1] of all the businesses in the small town of Poughkeepsie since

[1] *American Economic Review*, 1938.

1844. The results can be summarised in the following form :

TABLE XVIII

BUSINESSES IN POUGHKEEPSIE
MEDIAN DURATION OF LIFE

	Age of Business	Duration of Present Ownership
Retail	3	3
Wholesale	5	4
Manufacture	4	3
Craft	3	2½
Service	3	2½

The figures are exceptionally low. It will be seen that the second column is not much below the first, i.e. when a proprietor abandons a business, it is generally abandoned altogether, and not very often sold to another proprietor. The proportion of retail businesses surviving for three years or less did not vary very much between classes of business; it

TABLE XIX

	Median Years	
	Age of Business	Duration of Present Ownership
Wholesaling	19	14
General and mixed retailing	22	4
Clothing and footwear	10	5
Crockery and hardware	10	7
Electrical and radio	5	5
Butchery	23	6
Fruit and vegetable	14	4
Grocery	22	6
Other food	12	4
Chemists	22	12
Newspapers, books, stationery	19	5
Petrol	20	5
Hairdressing	14	5
Bars and saloons	..	5
Cafés	12	3
Other	14	9

was highest among confectioners, tailors and saloon keepers and lowest among barbers.

Another study[1] showed that the rate of turnover of shops in Louisville in the 1920s was about 25 per cent per annum and that about the same ratio had prevailed in the 1890s.

On the other hand, a recent study in Brisbane, Australia (Table XIX),[2] gives much higher figures for many classes of retail businesses, and also a much higher ratio between the two columns (i.e. when one owner abandons a business he generally manages to sell it to someone else). There must be a profound difference between Australian and American trading conditions, and it would be useful to have data from a number of other countries to see in which class they fall.

The amount of transport required to produce a given volume of real product may vary very much between countries, and may increase or diminish. Statistics are

TABLE XX

METRIC TON KM. OR PASSENGER KM. OF TRANSPORT PER I.U. OF REAL NET PRODUCT

		Great Britain, 1952. Glover and Miller, *J.R.S.S.*, 1954	Italy [b]		Germany (Official)	U.S. (Inter-city only) (Official Estimates)				
			1938	1952	1951	1920	1929	1939	1944	1951
Ton km.	Total .	2·78	2·10	2·38	3·86	..	..	11·89	10·65	..
including	Rail .	1·04 [c]	1·51	0·95	2·34	10·20	7·45	5·27	7·23	5·60
	Road .	1·20	0·59	1·43	0·46	..	..	0·68	0·47	1·14
	Water .	0·54 [a]	..	..	1·06	7·15	7·50	4·95 [e]	1·67 [f]	1·52 [g]
	Pipeline		..	..	..	..	..	0·99	1·28	1·30
Passenger km.	Total .		1·69 [h]	2·36 [h]	3·68	..	..	..	3·02	..
including	Cars .		..	..					1·61	..
	Buses .		0·16	0·72	2·17	..	..	..	0·31 [d]	..

Mileage reckoned by *overland* distance.
Della Porta, *Review of Economic Conditions in Italy*, Banco di Roma, November 1953.
Was 1·61 in 1920.
Buses averaging 40 seats at 20 cents per bus mile 51 per cent load factor in 1940, 28 cents per bus mile and 78 per cent load factor 1943 (*Fortune*, September 1944).
Of which 3·44 coastwise.
Excluding coastwise.
[f] Of which 0·33 coastwise.
Excluding private cars.

[1] *American Economic Review*, 1931, p. 29.
[2] *Economic News*, October 1953.

not very abundant, because there are few adequate and comprehensive estimates of the ton mileages carried by road, which in some countries now exceed that carried by rail. In Table XX transport requirements in the U.S. seem to be high but decreasing; in Great Britain, low but increasing (the rise in the volume of road transport exceeds the fall in rail transport). In both Britain and Italy now road transport carries more ton mileage than rail — a great deal more, if we exclude coal traffic.

TABLE XXI

DATA FOR U.S.S.R.

TRANSPORT REQUIREMENTS PER I.U. OF REAL PRODUCT

	Ton Kilometres	Passeng Kilomet
1913	4·94	. .
1928	4·52	1·28
1938	12·5	3·58
1951	14·6	3·7

Attempts to compare real costs per ton km. of transport in different countries, at different times or by different methods, made directly, are not very fruitful. Most forms of transport involve incurring a terminal and a marginal cost, the latter dependent on the length of journey, the former irrespective of the length of journey. Sea transport has outstandingly low marginal costs, and terminal costs represent a very substantial proportion of the whole. Road transport, as it becomes more highly organised, is tending to show a high ratio of terminal to marginal costs. The simplest forms of transport involve virtually no terminal but a very high marginal cost.

Every railway system's scale of charges involves, in effect, a terminal and a marginal *charge*, but, as we know all too well, these charges do not necessarily represent the costs actually incurred. The office of the Federal Co-ordinator of Transport (a post since abolished) in Washington did set out to make a direct estimate, from railway

operating accounts, of terminal and marginal costs in 1932. But nearly all the information on this subject has to be obtained by indirect methods of estimation. In the following table varying currencies have all been re-stated in I.U. terms:

TABLE XXII

	Terminal Cost or Charge (I.U. per Metric Ton)	Marginal Cost or Charge (I.U. per 000 Ton Km.)
Costs—		
U.S. railway costs, 1932 [a]	1·55	4·6
Cost of road transport, U.S.[d]	0·8–1·6	13·6
Cost of road transport, U.S.[e]	1·2	11·5
Costs by road, Britain [f]	0·25	13·5
Costs by road, Britain, estimated under most favourable conditions [g]	0·9	6·6
Costs by road, Ceylon [h]	0·05	23·7
Sea transport, colliers [c]	0·65	0·45
U.S. internal waterways, 1932 [i]	2·1	1·45
U.S. inter-coastal traffic, 1932 [i]	3·1	1·0
Trans-Atlantic (from U.S.) [e l]	1·83 [k]	0·95
Charges—		
U.S. railways, miscellaneous manufactures, car load lots, 1952 [b]	4·67	14·0
U.S. railways, coal [c]	0·67	2·3
British railways, coal [c]	0·5	6·7
Charges for coal, British waterways [c]	0·25	8·3

[a] Direct estimate by Federal Co-ordinator of Transport.

[b] Computed from freight books by Professor Chauncy Harris, Chicago. Refers to the most highly charged manufactures.

[c] From a paper by Mr. G. R. Peterson at the 1952 Congress of the Union Internationale des Producteurs et Distributeurs d'Énergie Électrique. Figures for sea transport are actual costs of colliers owned by British Electricity Authority and used in coastwise traffic.

[d] F. K. Edwards, *American Economic Review*, May 1947. The higher figure refers to a business handling 5000 tons per annum, the lower to a business handling 10,000 tons per annum.

[e] Estimate prepared by Professor Mayer, Professor of Transport, University of Chicago, privately communicated.

[f] Costs of coal haulage, British Electricity Authority expenses, source as above.

[g] Privately communicated by a prominent operator.

[h] International Bank Report on Ceylon. In mountainous regions marginal cost may be double that included here.

[i] Federal Co-ordinator of Transport.

[k] For a ship not flying the U.S. flag. Professor Mayer is of the opinion that this termina cost rises about 50 per cent for an American ship, owing to higher wages, etc.

[l] It was estimated (*Economist*, 4th November 1944) that a "Liberty ship" with a full load of 6400 tons would cost, at American wage rates then prevailing, $7000 or 5800 I.U. per day to run. Average daily journey would be 400 kms., which makes the marginal cost as high as 2·3 I.U. per thousand ton km. before any allowance has been made for the time occupied in loading or unloading, or for empty running.

In addition we may use some data from the following table, which has been converted from cents per ton mile, on the basis of 1 cent per ton mile (in 1937–9) being equivalent to 7·35 I.U. per thousand metric ton km.:

TABLE XXIII

TOTAL (TERMINAL AND MARGINAL) TRANSPORT COSTS IN U.S. 1937–39 IN I.U. PER THOUSAND TON KM.

(From Fair and Williams, *Economics of Transport*)

	Coal	Petroleum	General Cargo
Rail	3·0–3·7 *	4·4–7·3	4·4–6·6
Lake vessel . . .	0·4	0·5–0·7	0·7–1·5
River barge . . .	1·1–3·1	1·5–4·4	2·0–2·6
Truck	..	14·7 †	25·7–29·5
Pipeline	..	3·0 ‡	..

* Was said to be 7·3 when Isard wrote in 1945.
† Bulk handled (*Fortune*, February 1941). In smaller lots cost is 51·5.
‡ Isard, *Quarterly Journal of Economics*, February 1945.

We may first consider charges by water transport. For long distances — trans-Atlantic or U.S. inter-coastal — both terminal and marginal costs are higher than for shorter journeys on British coasters. For internal water transport in the U.S.A., taken altogether, terminal and marginal charges are also fairly high. But these are a composite of very different costs by lake and by river, as shown in Table XXIII. The Federal Co-ordinator of Transport estimated the terminal charge for all inland waterway journeys at as high as 2·1 I.U. per ton, but obviously this does not apply to lake vessels. The lake voyages will be anything up to 1000 kms. in length, with a few shorter ones, but we might say that the order of magnitude of the average voyage would be 750 kms. If we assume that costs of the lake ships are comparable with half those of British coasters, the sum of terminal and marginal costs, for a journey of 750 kms., would be 0·5 I.U. per ton, or 0·65 I.U. per thousand ton km., which is within the range of charges given in Table XXIII. Mr. Isard's paper of 1945, which carried forward the study

of the economics of transport considerably, draws strong attention to the unusual economic advantages of lake transport. The ship has to carry a minimum of crew, fuel and stores, and does not have to face such rough weather as a sea-going ship, and so can be more lightly constructed.

The median length of voyage by river is probably well below 1000 kms. In that case the total cost, computed from the figures of the Federal Co-ordinator of Transport, should be about 4 I.U. per thousand ton km. Probably his figures are somewhat too high.

The charges made by British tramp ships, during recent years, in international commerce show a terminal charge varying from 1·7 I.U. per ton for coal traffic, which is regular and short-distance, to $3\frac{1}{2}$–4 I.U. for timber and grain, where the traffic is less regular, and often originates in remoter parts of the world, so that there is less chance of a balancing load.

Marginal charges are generally lower than the marginal cost of 0·45 I.U. per thousand ton km. found for B.E.A. colliers: the general level is only about 0·25.

The actual costs of loading and unloading a ship need not be very high, if mechanical equipment is used. Professor Mayer has estimated loading costs in a modern American seaport, for goods in small packages and not in bulk, at only 15 cents per ton. The high terminal costs of sea transport arise from the general expenses of the ship during the period that it is delayed in port (or, as often happens, when there is a circuitous or difficult approach in the neighbourhood of the port). Professor Mayer has also pointed out that merchants using sea transport also incur considerable costs at either end of the journey, for services not usually included in the shipping freight, such as charges for wharfage and stacking, which may be, he thinks, under American conditions, as much as twice the terminal costs incurred by the shipping company.

The Federal Co-ordinator of Transport apparently devoted considerable care to establishing the over-all terminal and marginal costs of rail transport, and we should be able to accept his figures. The U.S. railways

charge for coal transport, both terminal and marginal, is about half of these. It may well be nevertheless that the coal traffic is the most profitable element of the whole railway operation. Many outstanding terminal charges are avoided in coal transport, such as cost of stations, handling of small individual consignments, clerical and business expenses. But it also appears that the marginal costs on coal are lower too — which may be explained by this article generally being consigned in complete train-loads, carried in a large and cheap type of vehicle, and with negligible risk of damage in transit. The British railways, in comparison, work at a somewhat lower terminal cost and a considerably higher marginal cost, which is not surprising in view of the much smaller vehicles and lower speed of trains on the British railways. For water transport, minimum terminal costs are found on British waterways, but with high marginal costs, again due to the small size of the average barge.

A representative list of fairly bulky manufactured goods, even when consigned in car-loads, has to pay charges on the U.S. railways about three times the estimated over-all costs. Such manufactures only provide a small part of the total traffic, and in the view of the railway officials (and the Inter-State Commerce Commission will also have to be convinced that the charges are reasonable) this differential is probably no more than is justified, at any rate on the principle of " what the traffic will bear ". In this connection it is interesting to note that the German railways have recently had a complete re-classification of their charges, and the ratio of the charges on the highest valued and on the lowest valued traffic is now only 2:1, very much less than it used to be.

The rail charges shown in Table XXIII for 1937–39 are rather too low in comparison with the Federal Co-ordinator of Transport's estimates for 1932, bearing in mind that the average length of haul then was about 550 kms. Charges on coal, both terminal and marginal, being about half the average cost, and coal constituting about one-third of the traffic, the over-all cost of carrying

other traffic should be about 25 per cent higher than the Federal Co-ordinator of Transport's figures, or, say, 2 I.U. per ton terminal and 6 I.U. per thousand ton km. marginal. Average receipts from all traffic in the period 1937–39 were 0·975 cent per ton mile, or 7·2 I.U. per thousand ton km. Excluding coal, this latter figure should rise to about 9 — which is the order of magnitude we would expect.

It is possible to make an analysis of terminal and marginal railway *charges* on a number of European systems, thanks to an analysis of freight charges for a representative list of goods, for various distances on European railways, published in the International Section of the 1938 *Statistisches Jahrbuch für das Deutsche Reich.* To these, Australian figures have been added, directly computed from the freight tables.

TABLE XXIV

	Terminal I.U. per Ton	I.U. per 000 Ton Km.
Poland	2·22	1·42
Denmark	1·89	5·13
Switzerland	1·83	4·13
Germany	1·65	2·62
France	1·08	5·85
Italy	0·84	7·63
Sweden	0·69	4·70
Belgium	0·65	4·25
Czechoslovakia	0·61	7·22
Hungary	0·52	8·20
Median Europe	1·0	4·9
Australia (Queensland)	1·02	11·2

It is clear that different countries follow very different policies in apportioning charges between terminal and marginal, with both Poland and Germany offering extraordinarily low marginal charges (or, as they are usually described in railway administration, highly "tapered" rates). The Australian figures are for the State of Queensland only. New South Wales, which has a more elaborate railway system, quotes much lower marginal rates. The

median of all the European charges comes out at 1·0 I.U. per ton terminal and 4·9 I.U. per thousand ton km. marginal. It was to be expected that the terminal charges would prove to be lower than in the U.S., and the marginal charges higher — but not very much higher.

The figures for road and rail charges can be checked by comparison with each other. It is a commonplace that the railway is likely to be cheaper for the longest journeys, the road for the shortest; but there is an economic balancing point somewhere between them, which can be approximately observed from general knowledge. Comparison of terminal and marginal costs by road and by rail should make it possible to deduce the length of such an equilibrium journey, and compare it with observation. It should be remembered that, when goods are sent by rail (except in the case of wagons handled at sidings), a short road haul is incurred at both ends of the journey. To allow for this, we should add to the terminal costs by rail a figure about equal to twice the terminal costs of a road journey. Under British conditions (excluding coal traffic) we have the following calculation:

TABLE XXV

	Terminal Costs I.U. per Ton	Marginal Costs I.U. per 000 Ton Km.
Road haulage	0·25	13·5
Rail transport	2·0	6·0
Rail transport including collection and delivery costs	2·5	6·0

If x be the length in thousand kms. of the journey at which road and rail costs are equally balanced, then

$$2{\cdot}5 + 6x = 0{\cdot}25 + 13{\cdot}5x.$$

This equation gives an answer of 300 kms. or 186 miles. Common experience in present-day Britain would confirm that this is probably about the correct figure.

As things were in 1928 [1] we can take as typical a 3-ton

[1] Brunner, *The Problem of Motor Transport*, 1928.

Thornycroft vehicle (with solid tyres!) whose current running costs were 4·72 pence per mile, excluding labour. If we treat one-third of the wages as overhead and two-thirds as current costs, and assume 500 loaded miles per week average, we add 1·05 pence per mile, making in all 5·77 pence per mile, i.e. 1·92 pence per ton-mile or 24·7 I.U. per thousand ton kilometre. Assuming terminal costs[1] still 0·25 I.U. per ton, then we substitute 24·7 for 13·5 in the above equation, and deduce a value for x of 120 kilometres, or 75 miles. It is significant that Mr. Brunner's table of cost (and also one's own recollections of that period) shows that it was for about distances of 80 miles or less that the road could then compete with the railway.

It may be added that the existence of speed limits and legal (or customary) restrictions on long consecutive driving mean that a trip exceeding certain limits will probably involve the inconvenience, and cost, of the driver sleeping away from home. In 1928, with comparatively low speeds and with the driver being expected to help with loading and unloading, any journey over 80 miles probably did involve this objection. Even with modern high speeds and articulated vehicles, so that the driver need not wait for the unloading, journeys over 150 miles probably involve a certain amount of additional expense and difficulty, through drivers having to sleep away from home.

For the U.S., terminal costs of road haulage are much higher[2] and marginal costs lower. In short hauls to and from the railway, however, it is doubtful whether such high terminal costs would be incurred and such costs might be nearer the British level. In any case, so much of the rail transport in the U.S. now is to and from businesses which have their own sidings. To allow for incidental costs of loading and unloading, therefore, the terminal cost

[1] Including one-third of the labour bill, standing charges, including tax and interest, were £3·1 or 16 2 I.U. per week. If we assume that the 500 loaded miles consisted on the average of 20 journeys of 25 miles each, this represents 60 tons consigned per week and an average terminal cost of 0·27 I.U. per ton.

[2] As indeed they are under the most favourable conditions in Britain, with regular two-way loads and the use of articulated vehicles, which raise terminal but reduce marginal costs.

of railway transport will only be raised from 2·0 to 2·5, as in Britain.

A calculation of the length of journey at which road and rail costs are equated, using either Professor Mayer's or Mr. Edwards's estimates of road costs, gives a result which is obviously far too low, of only about 100 miles, whereas experience shows that the figure is somewhere between 200 and 300 miles. (The figures in Table XXIII from the *Economics of Transport*, from 1937–39, are higher still; the real costs of road transport have been greatly reduced since that date.) If we take it as known that the "balancing distance" between road and rail transport in the U.S. is about 250 miles or 400 kms., and assume that the terminal cost of road transport is 1 I.U. per ton and treat the marginal cost as the unknown, then the marginal cost works out at 9·75 I.U. per thousand ton km. as against Professor Mayer's 11·5.

This result appears quite plausible. There seems to be a sharp downward trend in this figure, judging by the high figures for 1937–39 and Mr. Edwards's somewhat higher figures for 1947. This downward trend has been largely brought about through increasing the size of vehicles and by articulation.

There is another consideration, however. The buyer of transport services no doubt pays first attention to cost, but a number of less tangible factors have to be taken into account as well; and in nearly every case, for distances of the sort for which road and rail are competing, these intangibles are on the side of the road. They are well known: higher over-all speed, when collection and delivery times are taken into account; greater reliability, on many routes of delivery by a specified hour; reduced risk of loss from breakage and pilferage, and permissibility therefore of lighter packing for road haulage. If we take these factors into account, both the British and American equations would be altered. This adjustment to the equation implies that if we take our "balancing distances" as known, then marginal costs of road transport may be a bit *higher* than we have estimated.

It now remains to review the much more costly methods of transport which are still practised over a large part of the earth's surface. We shall continue to reckon in I.U. per thousand metric ton km.;[1] though whereas hitherto we have dealt mostly in single digit figures, we shall now have to deal with figures which are far higher (and less precisely known). Our analysis is simplified by the fact that marginal and total costs are now practically identical. Terminal costs, for such simply organised services, are inappreciable. For motor truck haulage in Ceylon they work out at 0·05 I.U. per ton as compared with marginal costs of 24 I.U. per thousand ton km. on level ground, and about twice that in mountainous country.

A very interesting indication of the reduction of road transport costs comes from Chile. Two separate studies[2] for a mountain route where the road has recently been greatly improved, show costs since 1937 falling from 45 I.U. to 10 — this lower figure is comparable with U.S.A. or Britain. In either case, terminal costs are less than 1 I.U. per ton. A figure of 12 is regarded by transport authorities as generally applicable throughout the world in a region where the roads are good, and has been considered applicable in the better districts of China.[3] On the other hand, an earlier estimate for China gives a figure of twice this amount.[4] To secure costs even of this order of magnitude requires reasonable facilities for fuelling and repairs, etc. Under adverse conditions, as on the famous "Burma Road", the cost figure stood at over 180, measured in the same units.[5] One would regard this as a world record were it not that Miss Deane claims an equally high cost for Northern Rhodesia.[6] As the costs of road haulage rise to these alarming heights (due to bad roads, and still

[1] 1 U.S. cent per ton mile (ton of 2000 lb.) at present-day purchasing power represents about 3·8 I.U. per thousand metric ton km.

[2] Rudolph, *Geographical Review*, September 1952.

[3] Ho Sen Chen, *Weltwirtschaftliches Archiv*, March 1937.

[4] R. H. Tawney, *Land and Labour in China*. The figures refer to a haul of 233 miles in Shensi in 1930. The roads in this province should be better than in the rest of China.

[5] Rudolph, *Geographical Review*, December 1942.

[6] *Studies in Income and Wealth*, vol. viii.

more, to unskilled drivers and mechanics) a competitive form of transport, in one or two well-watered areas, is found to be the old-fashioned sailing-boat. The order of magnitude of its costs appears to be in the neighbourhood of 25.[1] On the other hand, in Bengal[2] a much higher figure of 65 was found, at which rate the sailing-boat is in competition with the ox-wagon. A figure of 40 units for wagon transport is generally accepted in most parts of the world, including India, although the costs may sometimes be higher.

Descending the scale, the next most primitive form of transport, in regions where the roads are not good enough even to take an ox-wagon, is by pack animals. Here the charge may sometimes be as low as 80, but its general range is 100–120, and may be as high as 160 (for pack llamas[3] in Chile).

It remains now to consider human porterage, as used in the least economically developed regions of the world. Only in China is the wheelbarrow extensively used, and the costs, according to Professor Buck,[4] range from 80 units upwards. Even in the most primitive economies we must reckon a wage of about 60 I.U. per year per able-bodied man,[5] and the capacity of a head porter is given by Professor Gourou[6] at 30 miles per day with a load of 90 lb. This represents a cost of almost exactly 100 I.U. per thousand ton km. Professor Gourou's figures, on the other hand, appear high both for weight and for distance, and we may well prefer to accept the Indian cost,[7] which is as high as 270 I.U. per thousand ton km.

[1] Ho Sen Chen, *Weltwirtschaftliches Archiv*, March 1937.
[2] Report on the Marketing and Transport of Jute, 1940.
[3] Not, of course, to be confused with lamas. As Belloc so aptly advised us:

> "The former is a beautiful and valuable beast
> But the latter is not lovable nor useful in the least.
> And the Ruminant is preferable surely to the Priest
> Who battens on the woeful superstitions of the East. . . ."

[4] *China's Farm Economy*, p. 35.
[5] In an African context we can express this as a wage of 2s. a day for 300 days a year, i.e. £30 or 60 I.U.
[6] In *The Tropical World*.
[7] Report on the Marketing and Transport of Jute, 1940.

It remains, for the sake of completeness, to examine the costs of air transport of goods; but under very few circumstances does it appear that this is a competitive form of transport (except when extreme speed is required). Such an extreme circumstance did occur in the case of the "Burma Road", where it was estimated[1] that, by using 20-ton planes with an 85–90 per cent load factor, costs could be brought down to 100 I.U. per thousand ton km.

It may be added that in New Guinea, which is mountainous and roadless, conditions approximate to the "Burma Road", and the air provides the cheapest form of transport, at a cost not greatly higher than that computed above for the Burma haul. One is also bound to mention the unusual case of a private airline between England and France at the present time which is able to convey light motor vehicles at a cost comparable with that of sea transport.

A good deal of further analysis of railway accounts is required before we can establish any valid figures of terminal and marginal costs in different countries. When we compare average charges per ton km. in different countries, the first fact which clearly emerges is that they are very much a function of the average length of haul — in other words, that they contain an important terminal as well as marginal element. If a curve is drawn on the assumption that the terminal and marginal costs in other countries expressed in I.U. are the same as in U.S.A., it is found that, in general, the figures for most countries lie somewhere in the neighbourhood of this curve. It is closely confirmed by the two other countries in which the average length of haul is high, namely Canada and India.

One interesting conclusion which appears to emerge is that these costs are, between different countries, rather more constant than might at first have been thought, and less dependent upon traffic density. It is sometimes believed by railway operators that increasing density of traffic invariably lowers real costs, whether we are dealing with a trend through time or comparison between

[1] Rudolph, *Geographical Review*, December 1942.

countries. "There is no trouble in the railway business that high volume of traffic cannot cure."[1] Freight traffic density, in million ton km. per km. of line per year, in the 1930s stood in the neighbourhood of 1 million for Great Britain, Germany and U.S.A., but less than ¼ million in Denmark, Sweden, Australia and New Zealand. In U.S.A. it has now risen to nearer 2 millions, whereas in Russia it rose from 1 million in 1913 to 4 millions in 1938,[2] and nearly 8 millions now. Yet costs in all these countries are comparable; indeed, in some cases, the lightly loaded systems are more economical to run than the densely loaded. Increasing density brings certain disadvantages in the shape of greater signalling costs, delays through congestion, etc.

We may next set out to measure the trend of efficiency in railway operation by estimating the real costs in man-hour terms, or examining whether the improvement in efficiency is as rapid as in other industries. Professor Fourastié[3] has shown the ratio between the price of third-class railway travel in France and unskilled wages. On a 1910 base the index has moved as follows:

1850	2·07	1900	1·14
1860	2·14	1920	0·35
1870	2·14	1930	0·35
1880	2·07	1940	0·42
1890	1·85	1948	0·28

This leads to the interesting conclusion that there was little improvement in railway efficiency before 1880, an improvement at the rate of about 1 per cent per annum in the 1880s, a very rapid improvement in the 1890s, with the

[1] Mr. J. J. Pelley, President of the Association of American Railroads, in *The Railway Age*, 1947.

[2] Professor Khachaturov (*International Affairs*, April 1945, p. 228), in a very interesting paper, shows that train density was highest in Britain, with about 20,000 train kms. per km. of line per year in 1937; but the average goods train was lightly loaded and the proportion of passenger trains was high. In the U.S.A. the corresponding figure was only 4000, but the average goods train was fairly heavily loaded. Russian train density in 1939 stood at 10,000 and the gross weight of the average goods train was 77 per cent of the American. It is not known whether the great increase in traffic density since 1938 is due to increased train mileage or to increased average load of train.

[3] In *Prix de Vente et Prix de Revient*.

pace of improvement slowing down again to 1 per cent per annum in the period 1900–10. The fall between 1900 and 1920 is partly illusory, because most of the real burden of fixed charges was extinguished by inflation in this period. But, even assuming that fixed charges were extinguished altogether, there must also have been a substantial reduction in the real costs of operation. Up to 1940 there was no further reduction in real costs. The 1948 figure is affected by a further reduction in the real burden of fixed costs, and also by subsidies, and does not establish a trend.

The following are the percentage rates of improvement in real product per man-hour (compound interest rates) calculated for railways in U.S.A. by various investigators:

TABLE XXVI

	Period Covered	Rate of Improvement per Annum per Cent
Weintraub and Magdoff, *Econometrica*, October 1940	1919-29	2·17
Fabricant, National Bureau of Economic Research, *Occasional Paper 7*	1899–1939	2·66
U.S. Department of Commerce, *Survey of Current Business*, April 1943	1916–41	2·91
	1929–41	2·78

In Germany, on the other hand, according to official statistics, a fall of 21 per cent in hourly wage rates between 1929 and 1938 was accompanied by a fall of 22 per cent in charges per ton km. and 21 per cent in charges per passenger km., i.e. efficiency was virtually unchanged.

In New Zealand also (*Canterbury Chamber of Commerce Bulletin*, November 1940), while the volume of railway traffic rose 30 per cent between 1934–35 and 1939–40, the railway personnel rose 60 per cent and the number of man-hours worked rose 42 per cent. In 1934–35 the number of man-hours worked was 15 per cent higher than in 1919–20, with an approximately stationary volume of traffic.

An almost perfect "laboratory test" of the effect of increased traffic density was shown on the U.S. railways,

when the ton milage rose steadily from 292 billions in 1938 to 730 billions in 1943. It should be added, however, that the American railways had carried 450 billion ton miles in 1929, and were obviously working under capacity in 1938.

Mr. Thor Hultgren in a pamphlet published at the time [1] showed that ton miles carried per man-hour were an almost linear function of aggregate ton mileage. This result is very largely due to the better loading of cars; the number of cars per train (loaded car miles per train mile) rose rapidly to a maximum beyond which it is very difficult to raise it further.

Some of Mr. Hultgren's relationships can be tested out for earlier periods. It is found that they hold in general, subject to some fairly sharp intermittent advances in efficiency (at a given traffic volume) of the whole system.

TABLE XXVII

Traffic, Billions of Revenue Ton Miles per Month	Ton Miles * carried per Man-Hour of Railway Labour			Net Ton Miles per Car Mile (1938–43)	Loaded Car Miles per Train Mile (1938–43)
	1905–14	1921–25	1933 onwards		
20	63	..	..	..	..
25	69	..	145	25·9	29·0
30	73	100	..	..	..
35	78	108	171	28·1	31·5
40	..	114	..	..	..
45	..	120	193	30·4	32·3
55	..	..	211	32·6	32·6
65	..	..	230	34·9	33·0

* Passenger miles expressed as ton miles on the basis of their revenue-earning capacity.

The figure of loaded car miles per train mile stood at 25 in 1929, having risen from 18 in 1901. But apparently this cannot be expanded rapidly beyond a certain limit. Ton miles per loaded car mile, which were only 16·5 in 1901, rose rapidly, with increasing size of vehicle, to 29·5

[1] National Bureau of Economic Research, *Occasional Paper 15.*

in 1920. The composite of these two factors, namely tons per train (revenue and free-hauled), which stood at only about 200 in 1890 and 300 in 1900, rose to 849 by 1940 and 1116 by 1943. In addition, average over-all speed rose from 11·0 miles per hour in 1920–24 to 16·7 in 1940, but fell slightly during the war years.

The following table[1] appears to indicate that there may be "returns to scale" in air transport. The productivity of employees on U.S. air-lines is much higher than in Europe. On the other hand, the Trans-Canada and Trans-Australia air-lines show a higher productivity than any European system, even though their aggregate product and average length of trip are not very high.

TABLE XXVIII

	Product (Millions of Passenger Miles)	Average Trip (Miles)	Productivity (000's of Passenger Miles per Employee)
U.S. Air-lines (1953):			
American	3290	570	197
United	2720	690	183
Trans-World	2880	930	192
Eastern	2500	530	245
Pan-American	2020	1210	116
Average of five next largest	650	540	167
European Air-lines (1952):			
B.O.A.C. and B.E.A. combined	1210	750	45
Air France	930	860	68
B.O.A.C.	860	3130	48
K.L.M.	630	1260	49
B.E.A.	360	270	40
Sabena (Belgian)	220	810	44
Swissair	140	480	60
Commonwealth (1952):			
Trans-Canada	650	580	96
Trans-Australia	310	470	91

[1] Published in *Manchester Guardian*, April 1954.

CHAPTER VIII

CONSUMPTION OF PRINCIPAL CLASSES OF GOODS AND SERVICES AS A FUNCTION OF REAL INCOME

We have hitherto been accustomed to think of the demand for food, or for any other commodity, being determined predominantly by price and income, showing both price and income elasticity of demand. The more attempts are made to measure them, however, the more uncertain these concepts become, and the more it appears that price and income elasticity of demand, which can be precisely defined and measured, nevertheless themselves vary greatly with income.

A new and more hopeful approach has recently been developed in Cambridge by Messrs. Aitchison and Brown.[1] Every commodity, they reason, must have a saturation demand — that demand beyond which a consumer does not go however high his income. The first step therefore is to express each demand as a percentage of saturation demand, and to relate it to the logarithm of real income. While it is clear that the demands for some commodities are saturated at a much lower level of real income than others, it appears that we can say, in very general terms, that the demand for every commodity when plotted in this way rises in an S-shaped (possibly probit) curve, i.e. with income elasticity of demand increasing at low income levels and decreasing at high.

These relationships are first tried out for food. A large number of data are now available from F.A.O. and other sources.

[1] *Economica*, October 1954.

[*contd. on p.* 439

TABLE I

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butter[e]
	Total[b]	Wheat-flour[h]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Argentine:												
1925–29	..	..	..	..	..	107·2	5·0	6·9	..	..	..	..
1930–34	..	..	..	..	..	102·1	5·0	6·4	..	..	..	..
1935–39	106·1	98·7	3·8	3·6	106·9	77·8	8·6	8·8	163	2·5	9	1·6
1948	124·5	118·2	3·6	2·7	114·4	80·2	7·7	13·9	165	4·4	16	2·6
1951	111·0	..	..	..	103·0	89·3	6·8	5·9	165	..	18	..
Australia:												
1888	..	118·0	..	..	110·0	..	..	..	..	2·7	..	7·2
1900	..	108·0	..	..	126·0	..	..	..	..	1·8	..	9·1
1914–21	..	100·0	..	..	82·0	..	..	..	..	1·6	..	11·3
1925–29	..	92·0 [1]	..	..	..	65·2	7·4	28·1	127	1·8	16	13·4
1930–34	..	..	..	..	..	43·4	7·2	35·0	138	1·8	..	13·3
1936/37–38/39	101·4	86·0	2·8	11·7	120·4	65·4	9·4	34·1	164	2·0	16	14·9
1947/48–48/49	96·4	92·8	0·6	3·0	110·2	57·1	9·1	32·5	..	2·5	..	11·1
1950/51–52/53	98·0	..	..	..	107·7	..	..	..	185	..	16	13·8
Queensland: 1939–40	91·0	90·0	..	1·0	54·0	..	..	..	133	3·0	..	16·2
	89·0	88·0	..	1·0	66·06	..	..	..	130	3·7	..	18·4
	90·0	89·0	..	1·0	73·0	..	..	..	157	3·7	..	19·4
	90·0	89·0	..	1·0	84·0	..	..	..	171	4·7	..	20·8
	87·0	85·0	..	2·0	81·0	..	..	..	177	4·2	..	19·9
Austria:												
1925–29	..	..	..	..	..	14·9	..	..	..	..	..	..
1930–34	..	..	..	..	..	12·8	..	..	251 [1]	4·3 [1]	..	2·8 [1]
1934–38	138·1	66·2	4·3	67·6	49·0	15·8	28·1	0·3	199	3·9	18	3·6
1948–49	141·5	94·0	1·7	24·3	22·7	10·1	9·9	0·1	195	1·6	14	2·5
1950/51–52/53	120·0	..	..	..	39·0	..	..	..	185	..	16	..
Workers' households 1929–33	..	44·0	..	..	54·0	15·0	20·0	0·3	217	2·9	20	4·3
	..	42·0	..	..	52·0	13·0	20·0	0·1	194	2·4	19	3·8
	..	37·0	..	..	47·0	10·0	18·0	0·1	187	2·6	19	3·9
	..	27·0	..	..	33·0	6·0	11·0	0·1	136	1·5	17	1·8
Belgium:												
1910–13	..	198·0	..	..	39·0	..	..	..	..	..	..	..
1925–29	..	..	..	..	35·9	18·1	14·7	2·5	119	2·8	..	7·8
1930–34	..	..	..	..	37·9	16·7	18·5	2·3	129	2·9	..	9·3
1934–38	115·0	..	2·3	..	46·0	17·7	20·0	0·5	136	3·4	19	7·4
1947/48–48/49	106·2	91·6	1·5	13·1	44·6	..	..	..	115	2·8	18	9·8
1950/51–52/53	105·0	..	..	..	44·0	..	..	..	173	..	21	..
Workers' households 1928–29	137·0	..	..	..	33·0	16·0	11·0	..	153	3·3	17	8·9
	133·0	..	..	..	42·0	20·0	15·0	..	180	4·6	21	15·9
	133·0	..	..	..	54·0	27·0	18·0	..	196	5·9	23	20·4
	124·0	..	..	..	60·0	32·0	17·0	..	221	6·5	24	20·2
Brazil:												
1935–39	78·3	20·3	19·8	32·8	49·8	30·3	12·6	1·2	80	1·1	5	0·9
1948	79·3	19·4	27·5	32·4	39·4	24·8	9·3	1·2	79	1·2	6	0·9
1951	92·0	..	..	..	29·0	19·0	4·5	0·5	90	..	7	..

AT VARIOUS INCOME LEVELS

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[e]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
..	..	..	..	..	..	..	..	..	..	..	..	..	300	1
..	..	..	..	..	..	..	..	..	..	..	..	..	200	1
4·5	7·1	65·8	24·5	27·2	2·5	13·8	33·4	..	..	..	..	56·4	236	2
4·0	7·3	87·3	39·2	34·7	2·1	57·9		..	..	..	19·3	64·2	373	2
5·0	10·0	101·0	..	33·0	4·0	..	..	..	..	..	..	..	363	3, 4
..	..	97·0	..	43·0	..	..	..	..	..	..	..	..	405	5
..	..	90·0	..	49·0	..	..	..	..	..	..	..	..	355	5
..	..	57·0	..	51·0	..	..	..	3·6	0·2	..	56	..	324	6
6·4[1]	..	50·0[1]	..	50·0	..	50·0		3·4[1]	0·2[1]	..	48	..	479	7
..	..	..	..	47·0	..	47·0		..	..	..	..	..	411	7
5·1	12·0	48·7	65·0	53·3	2·5	14·4	60·3	..	..	..	..	..	506	2
4·2	12·8	56·6	72·9	52·0	4·6	16·1	63·5	..	..	..	..	..	657	2
4·3	10·7	46·0	..	52·7	5·0	..	..	..	..	..	..	..	697	3
..	13·3	40·0	..	44·2	..	..	..	3·7	0·6	0·6	..	..	202	8
..	15·8	42·0	..	47·3	..	..	..	3·8	0·6	0·7	..	..	324	8
..	17·4	43·0	..	41·7	..	..	..	3·9	0·7	0·8	..	..	437	8
..	19·7	46·0	..	51·1	..	..	..	4·9	0·7	0·6	..	..	567	8
..	20·8	51·0	..	51·2	..	..	..	4·7	1·1	0·5	..	..	850	8
..	5·0[2]	..	..	29·3	..	3·3	..	..	..	..	..	..	230	7
..	6·0[3]	..	..	26·3	..	4·9	..	..	..	..	..	..	225	7
2·0	7·0	96·0	58·0	24·1	4·0	4·4	38·5	..	..	..	..	..	210	2
2·0	3·5	113·0	60·0	22·8	3·0	4·4	39·3	..	..	..	..	..	226	2
2·0	5·0	108·0	..	25·0	3·0	..	..	..	..	..	..	..	270	3
2·1	11·0	45·0	41·0	23·0	..	40·0		0·13	..	0·37	..	..	319	9
2·6	11·0	43·0	39·0	23·0	..	44·0		0·09	..	0·37	..	..	270	9
1·9	10·0	44·0	39·0	21·0	..	44·0		0·09	..	0·26	..	..	219	9
0·9	6·0	43·0	32·0	17·0	..	26·0		0·06	..	0·23	..	..	109	9
..	..	..	..	14·0	..	..	..	..	..	..	..	..	310	10
..	14·0	..	..	25·0	..	4·1	..	..	..	..	..	..	287	7
..	14·0	..	..	27·0	..	9·1	..	..	..	..	..	..	318	7
10·0	8·0	157·0	50·0	28·0	7·0	30·0		..	..	..	..	..	344	2
11·0	9·0	142·0	68·0	26·0	4·0	47·5		..	..	..	..	..	479	2
11·0	12·0	153·0	..	28·0	4·0	..	..	..	..	..	..	..	523	3
7·5	5·8	196·0	29·0	15·0	..	7·3		..	4·2	..	..	..	114	9
6·9	9·9	193·0	37·0	20·0	..	13·6		..	5·9	..	..	..	136	9
9·8	12·3	186·0	42·0	21·0	..	17·9		..	6·9	..	..	..	260	9
10·7	13·6	193·0	47·0	26·0	..	21·3		..	7·4	..	..	..	343	9
1·4	2·6	46·0	20·0	25·0	23·0	68·0		..	..	..	..	..	150	2
2·9	2·7	75·0	24·0	30·0	22·0	81·0		..	..	..	..	..	168	2
3·0	3·0	122·0	..	32·0	24·0	..	..	..	..	..	..	..	180	3, 4

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TABLE I (*contd.*)

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butte
	Total[b]	Wheat-flour[a]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Burma:												
1934–38 .	149·0	2·4	141·8	4·8	8·9	5·6	1·5	0·1	17	..	4	0·1
1947–48 .	153·6	1·3	146·7	5·6	6·3	4·4	1·0	..	8	..	3	..
Canada:												
1925–29 .	..	..	..	..	..	29·0	31·9	2·5	[1]	1·6	..	12·8
1930–34 .	..	..	..	..	..	26·0	31·4	3·0	..	1·6	..	13·9
1935–39 .	92·6	83·1	1·9	7·6	61·7	29·4	18·3	2·5	221	1·7	19	14·0
1947/48–48/49	78·8	70·6	1·5	6·7	71·7	31·4	25·6	1·7	250	2·4	19	13·7
1950–53 .	78·7	..	..	..	69·7	..	..	..	241	..	19	10·3
Urban wage-earner families 4 towns 1938	..	53·0	..	..	..	22·6	5·0	..	107[1]	..	..	12·3
	..	56·0	..	..	..	21·2	6·8	..	135[1]	..	..	13·9
	..	52·0	..	..	..	24·8	7·3	..	131[1]	..	..	14·4
	..	54·0	..	..	..	22·2	10·4	..	143[1]	..	..	16·5
Ceylon:												
1934–38 .	131·6	4·2	124·4	3·0	8·3	4·4	0·1	0·1	8·4	..	0·7	..
1948–49 .	102·0	23·8	76·0	2·2	2·3	1·6	0·1	0·1	9	..	3·6	0·1
Chile:												
1935–39 .	123·8	113·8	5·0	5·0	38·4	23·8	3·9	7·0	54	2·4	5	0·9
1948 . .	133·7	119·0	9·4	5·3	37·6	22·6	4·4	7·0	68	3·2	6	0·8
1951 . .	122·0	..	..	..	28·0	20·4	4·5	4·5	80	..	7	..
China:												
1930 . .	..	..	..	..	..	..	..	..	..	..	..	..
Rural (1)												
Spring wheat area . .	..	29·0	..	131·0	3·7	..	..	..	..	..	..	0·1
Winter wheat-millet area .	..	48·0	2·0	103·0	1·6	..	..	..	..	..	..	1·5
Winter wheat kaoliang area .	..	45·0	1·0	118·0	3·3	..	..	..	..	..	..	1·5
Yangtze rice-wheat area .	..	30·0	165·0	30·0	7·3	..	..	..	..	..	..	3·3
Rice-tea area .	..	5·0	216·0	6·0	7·7	..	..	..	..	..	..	3·6
Szechwan rice area . .	..	4·0	132·0	27·0	12·4	..	..	..	..	..	..	1·5
Double cropping rice area	..	1·0	207·0	2·0	7·7	..	..	..	..	..	..	4·4
S.W. rice area	..	2·0	202·0	10·0	13·1	..	..	..	..	..	..	0·7
Urban (2)												
Middle class and teachers .	132·0	..	..	..	20·0	..	..	..	1	..	16·7	..
Handicraft workers .	145·0	..	..	..	2·0	..	..	..	..	..	1·5	..
Labourers .	168·0	..	..	..	..	..	..	..	..	..	4·0	..

AT VARIOUS INCOME LEVELS

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[g]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
37·2	5·0	6·1	50·4	9·0	9·1	40·5		..	..	..	..	..	..	2
33·6	2·3	7·5	46·0	6·0	10·9	37·4		..	..	..	..	..	..	2
..	16·3	..	..	42·0	..	..	..	..	..	..	..	..	568	7
..	16·2	..	..	40·0	..	..	..	..	..	..	..	..	420	7
5·4	13·8	90·1	46·8	43·0	5·7	11·5	24·9	1·6	1·6	1·7	..	..	493	2
6·1	15·7	88·1	57·7	43·0	6·7	17·6	28·8	..	..	..	..	..	796	2
6·0	14·7	..	..	45·0	5·7	..	..	..	..	..	..	..	846	3
2·4	6·8	63·7	..	20·3 [2]	..	..	..	1·9	..	..	..	..	180	11
2·6	8·9	53·1	..	23·1 [2]	..	..	..	2·1	..	..	..	..	300	11
2·8	10·3	77·8	..	22·2 [2]	..	..	..	2·4	..	..	..	..	420	11
3·5	13·2	81·4	..	17·9 [2]	..	..	..	2·6	..	..	..	..	540	11
12·0	0·5	46·0	40·4	12·4	8·3	1·2		..	..	..	..	..	..	2
7·5	0·4	37·8	39·5	13·3	61·7	1·2		..	..	..	..	..	..	2
7·2	1·7	73·3	50·0	25·4	10·3	41·7		..	..	..	14·0	65·0	245	2
11·3	2·0	79·5	54·0	26·0	6·0	40·9		..	..	..	..	..	249	2
16·0	5·0	58·0	..	30·0	9·0	..	..	..	..	..	..	..	270	3, 4
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	0·1	100·0	37·0	0·1	20·0	1·0		..	..	..	..	..	..	12
..	0·2	19·0	42·0	0·1	20·0	7·0		..	..	..	..	..	..	12
0·7	1·3	52·0	56·0	0·6	33·0	6·0		..		..	..	..	..	12
2·0	1·2	26·0	52·0	1·6	20·0	3·0		..	..	..	..	..	..	12
1·6	1·3	38·0	56·0	1·3	15·0	2·0		..	..	..	..	..	..	12
0·1	1·5	24·0	95·0	1·7	23·0	1·0		..	..	..	..	..	..	12
4·7	0·6	110·0	30·0	2·6	9·0	3·0		..	..	..	..	..	..	12
0·4	1·2	16·0	69·0	2·5	16·0	8·0		..	..	..	..	..	..	12
0·3	2·6	3·0	31·0	0·8	24·0	8·0		..	..	..	..	..	..	13
..	0·2	..	..	0·3	19·0	..		..	..	..	..	..	..	13
..	..	7·0	70·0	..	66·0	..		..	..	..	..	..	..	13

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TABLE I (*contd.*)

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butter[e]
	Total[b]	Wheat-flour[a]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Colombia:												
1935–39	57·4	9·8	6·2	41·4	26·2	21·2	2·5	0·2	93	2·7	3	0·7
1948	71·5	10·3	15·8	45·4	29·0	22·9	2·7	0·2	144	3·7	3	0·9
Cuba:												
1934–38	102·4	21·0	50·6	30·8	33·3	21·3	6·0	0·2	79	0·5	8	0·5
1948–49	106·3	26·3	49·0	31·0	35·4	24·6	5·4	0·2	90	1·0	11	0·6
Cyprus:												
1934–38	169·3	149·6	4·5	15·2	12·1	1·6	2·4	4·5	48	1·9	9	2·1
1948–49	171·3	141·1	4·0	26·2	17·1	1·7	6·0	5·7	41	1·3	10	2·1
Denmark:												
1925–29	..	..	..	..	..	19·0[1]	19·9	..	166	5·1	..	5·7
1930–34	..	..	..	..	..	22·7[1]	29·3	..	220	5·5	..	8·0
1934–38	93·9	43·3	2·2	48·4	74·6	28·0	29·6	0·8	195	5·4	27	8·9
1947–49	107·8	35·9	0·2	71·7	64·8	22·2	33·0	0·8	..	8·5	..	4·4
1950–53	97·0	..	..	..	56·0	..	..	..	204	..	24	..
Egypt:												
1934/35–38/39	182·1	54·9	16·8	110·4	7·4	1·2	..	0·7	40	2·9	5	0·4
1947/48–48/49	181·7	53·2	24·8	103·7	8·8	2·6	..	0·8	..	3·8	..	..
1950–53	170·0	..	..	..	12·0	..	..	..	57	..	5	..
Finland:												
1925–29	..	..	..	..	..	14·1[1]	11·9	3·4	..	..	..	..
1930–34	..	..	..	..	..	14·5[2]	11·9	2·2	..	..	..	..
1934–38	128·0	..	3·6	..	32·6	17·3	11·5	2·2	276	2·2	13	9·3
1947/48–48/49	139·9	59·4	0·1	80·5	25·0	11·0	11·3	1·6	..	1·8	..	7·3
1950–53	133·0	..	..	..	30·0	..	..	..	265	..	17	..
Workers' households 1928	95·0	..	..	..	21·6	7·2	7·1	..	272	0·6	12	10·0
	99·0	..	..	..	30·7	11·0	10·1	..	338	1·1	14	13·6
	98·0	..	..	..	36·7	14·5	10·0	..	416	1·5	15	16·6
	85·0	..	..	..	42·1	15·6	10·1	..	445	1·9	16	18·0
France:												
1812	..	..	..	..	17·0	6·6	8·1	2·2	..	..	..	..
1830	..	..	..	23·0[1]	21·0	9·6	8·5	2·8	..	..	..	..
1840	..	..	..	..	20·0	8·9	8·6	2·4	..	..	..	..
1852	..	124·0	..	..	23·0	11·9	8·2	2·9	..	..	..	..
1872	..	181·0	..	20·0[1]	30·0	..	..	..	..	..	..	..
1892	..	188·0	..	..	36·0	..	..	..	..	..	..	..
1904	..	180·0	..	..	..	..	..	..	..	..	..	..
1925–29	..	..	..	..	..	20·5	7·6	2·5	155	5·1	..	4·6
1930–34	..	..	..	..	..	19·6	8·4	2·4	171	5·7	..	6·0
1934–38	121·0	114·8	2·4	3·8	51·9	21·3	16·2	2·6	150	5·3	14	5·3
1947/48–48/49	114·0	108·0	0·6	5·4	50·6	22·0	15·8	1·5	..	4·3	..	3·5
1950–53	119·0	..	..	..	64·0	..	..	..	152	..	13	..

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[e]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
0·6	3·5	86·8	10·3	37·0	7·0	131·7		..	..	..	..	..	88	2
0·6	4·2	98·0	11·9	57·0	8·0	104·7		..	..	0·9	..	..	108	2
4·2	4·4	98·8	15·6	40·0	12·5	148·1		..	..	0·5	..	..	150	2
5·9	3·1	91·0	14·1	40·0	16·0	124·3		..	..	0·6	15·6	..	177	2
2·8	2·0	20·7	26·1	9·1	10·7	14·7	37·5	..	..	..	..	..	..	2
4·4	2·0	42·4	25·1	9·8	12·1	15·5	48·3	..	..	..	..	..	..	2
..	5·0	..	..	50·0	..	2·8	..	..	..	..	..	..	500	7
..	5·0	..	..	51·7	..	3·5	..	..	..	..	..	..	520	7
15·0	7·5	109·3	61·8	50·5	0·8	32·8		..	..	..	59·4	1·3	558	2
22·9	9·2	133·8	81·1	32·5	1·6	39·1		..	..	..	49·0 [2]	2·6 [2]	586	2
14·0	8·0	143·0	..	..	4·0	..	..	..	..	..	..	..	630	3
3·0	1·7	4·7	33·3	13·0	22·4	16·6	19·2	..	..	..	1·0	0·5	..	2
3·0	1·1	9·8	44·8	..	14·9	9·6	25·4	..	..	..	9·3	3·9	..	2
3·0	1·0	9·0	..	15·0	10·0	..	..	..	..	..	..	..	..	3
..	2·0	..	..	23·3	..	..	..	..	..	..	..	..	204	7
..	2·3	..	..	22·0	..	..	..	..	..	..	..	..	214	7
6·0	3·0	180·8	30·0	28·2	3·3	18·0		..	..	..	4·7	0·3	260	2
7·2	2·9	168·9	27·7	20·1	2·3	3·2		..	..	..	..	..	290	2
10·0	6·0	139·0	..	33·0	2·0	..	..	..	..	..	..	..	370	3
10·5	1·8	84·0	..	20·7	..	..	..	..	..	..	..	..	94	9
14·1	3·2	98·0	..	25·3	..	..	..	..	..	..	..	..	147	9
15·3	4·4	106·0	..	29·7	..	..	..	..	..	..	..	..	206	9
18·2	5·8	99·0	..	32·2	..	..	..	..	..	..	..	..	282	9
..	..	..	..	..	..	..	..	..	..	..	..	..	92	14
..	..	40·0	..	..	..	..	..	..	..	..	..	..	100	14
..	..	..	..	..	..	..	..	..	..	..	..	..	115	14
..	..	..	..	3·8	..	..	..	..	0·6	..	..	..	131	15
..	..	127·0	..	5·1	..	..	..	..	0·4	..	..	..	146	15
..	..	..	..	12·3	..	..	..	..	1·9	..	..	..	200	15
..	..	..	..	14·7	..	..	..	..	1·9	..	..	..	240	15
..	..	368·0 [2]	..	22·7	..	15·0		0·03	4·0	0·9	..	110·0	389	7, 16
..	8·5	376·0	..	24·5	..	23·1		0·04	4·5	1·1	..	117·0	356	7, 16
8·0	9·0	155·1	143·4	23·9	11·7	25·5		..	..	..	41·6	149·9	353	2
7·8	8·9	150·7	143·8	17·1	6·3	30·0		..	..	..	..	97·3	456	2
10·0	11·0	122·0	..	25·0	6·0	..	..	..	..	..	..	..	505	3

[contd. overleaf. Notes on pages 436-9

TABLE I (*contd.*)

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butte
	Total[b]	Wheat-flour[a]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Germany:												
1913	..	..	..	..	50·3	..	..	..	..	..	..	..
1925–29	..	54·7	1·9	53·1[1]	..	16·8	27·0	0·8	183	5·0	..	6·2
1930–34	..	47·0	2·7	53·2[1]	..	16·1	29·0	0·6	183	5·9	..	7·4
1935–38	113·1	107·8[2]	2·5	2·8	50·9	16·7	28·8	0·7[3]	160	5·0	..	8·6
Republic of Western Germany:												
1947/48–48/49	126·4	69·7	0·1	56·6	16·7	7·8	6·7	0·4	..	2·4	..	3·4
1950-53	99·0	..	..	..	38·0	..	..	..	157	..	21	..
Workers' households 1927–28	87·0	22·0	..	65·0	28·0	6·5	7·2	0·4	128	3·1	15	2·4
	87·0	26·0	..	61·0	34·4	8·2	8·4	0·4	160	3·7	16	3·7
	85·0	28·0	..	57·0	38·5	10·1	9·9	0·4	178	3·8	16	4·5
	80·0	29·0	..	51·0	44·0	11·6	11·1	0·6	194	4·5	17	6·5
	82·0	33·0	..	49·0	51·0	14·3	15·2	0·8	208	5·3	17	8·8
Greece:												
1934–38	156·8	120·8	4·2	31·8	20·2	..	..	..	75	7·9	15	1·0
1947/48–48/49	148·7	120·6	1·9	26·2	11·9	..	..	..	..	4·3	..	0·5
1950–53	153·0	..	..	..	..	..	..	..	65	..	14	..
												..
Hungary:												
1934–38	163·7	109·4	2·6	51·7	36·0	6·2	23·8	1·1	110	0·6	11	1·4
1947–48	174·7	92·8	4·1	77·8	23·0	4·7	13·2	0·2	66	0·6	7	0·5
India and Pakistan:												
1931	141·0	..	..	..	1·5	..	..	..	68[1]	..	3·3	..
1934–38	142·8	21·0	78·6	43·2	3·0	..	..	..	65	..	2·5	..
	215·0	..	..	..	3·5[2]	..	..	..	..	..	..	1·3
	180·0	..	..	..	9·3[2]	..	..	..	..	..	..	..
	175·0	..	..	..	27·0[2]	..	..	..	..	..	..	4·5
	146·0	..	..	..	21·4[2]	..	..	..	..	..	..	14·8
India: [4]												
1948–49	109·9	16·9	59·8	33·2	2·3	0·8	0·1	0·4	46	..	3·0	..
1950–53	113·0	..	..	..	1·0	..	..	..	46	..	3·0	..
Pakistan:												
1948–49	152·6	44·2	96·6	11·8	4·0	23·0	..	0·3	73[1]	..	1·5[2]	..
1949–52	156·0	..	..	..	4·0	..	..	..	81[1]	..	3·0[2]	..
Indo-China: [1]												
1934–38	143·5	0·9	139·7	2·9	13·6	2·7	8·3	0·2	13·0	..	2·2	..
1947–48	152·3	0·3	135·6	16·4	4·1	0·4	2·4	..	0·1	..	1·6	..
Ireland:												
1934–38	131·4	123·0	1·0	7·4	54·9	15·1	20·9	6·7	150	0·3	14	13·1
1947–48	132·0	124·6	..	7·4	59·5	24·5	16·5	6·4	..	1·3	..	14·8
1950–52	132·0	..	..	..	53·0	..	..	..	198	..	19	..

AT VARIOUS INCOME LEVELS

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[g]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
7·2	6·1	175·0	..	19·5	..	..	..	..	2·0	0·1	0·6	..	310	17
..	7·0	..	49·1	23·7	..	5·0	28·0	..	..	..	..	..	303	7, 18
..	7·4	..	49·8	22·4	..	5·0	29·0	..	..	..	..	..	297	7, 18
12·0	7·2	176·0	50·0	24·0	3·1	35·9		..	..	0·9	62·0	6·0	440	2
7·8	2·7	188·3	49·8	17·1	4·2	38·7		..	..	..	..	..	280	2
7·0	7·0	181·0	..	25·0	3·0	..	..	..	..	..	..	..	410	3
5·3	3·8	125·0	25·3	12·8	..	11·5		0·1	0·5	0·4	..	..	128	9
5·1	6·3	136·0	28·8	15·6	..	17·3		0·1	0·7	0·4	..	..	191	9
5·4	7·1	135·0	32·7	15·0	..	22·1		0·1	1·0	0·4	..	..	234	9
6·2	8·3	126·0	37·5	16.6	..	27·5		0·1	1·4	0·3	..	..	287	9
7·0	10·9	128·0	39·2	17·1	..	40·0		0·1	2·0	0·3	..	..	393	9
7·2	4·6	13·3	49·0	10·2	12·4	3·3	25·5	..	..	..	..	..	190	2
8·2	2·9	30·3	47·6	8·7	14·0	57·7		..	..	..	..	..	136	2
9·0	3·0	38·0	..	10·0	15·0	..	..	..	..	..	..	..	175	3
0·9	6·4	111·6	43·3	10·0	6·7	49·4		..	..	..	..	..	152	2
0·5	2·7	58·1	26·1	9·7	7·0	32·4		..	..	..	..	..	139	2
6·9	..	..	..	15·9	..	34·0		..	..	..	..	..	..	19
1·6	0·4	7·7	25·0	13·0	22·0	26·2		3	..	..	..	..	..	2
..	..	..	78·0	5·0	..	..		..	..	..	..	..	75	20
..	..	..	95·0	11·0	..	1·0		..	..	..	..	..	230	20
..	..	..	111·0	15·0	..	6·1		..	..	..	..	..	600	20
..	.	..	145·0	2·0	..	32·0		..	..	..	..	..	1800	20
1·1	0·1	6·0	16·3	..	21·1	25·1		..	..	..	..	..	..	2
2·0	..	..	12·0	..	23·0	..	..	..	..	..	..	..	..	3
..	0·3	4·8	20·0	..	11·1	30·5		..	..	..	..	..	..	2
..	..	5·0	..	13·0	16·0	..	..	..	..	..	..	..	..	3
22·8	3·0	18·2	71·0	6·8	4·7	48·4		..	..	..	..	..	..	2
12·4	1·0	44·7	80·0	6·5	7·1	73·0		..	..	..	..	..	..	2
3·0	15·8	195·4	53·2	38·1	1·0	19·5		..	..	..	..	..	356	2
2·7	12·4	197·1	57·4	26·2	1·2	20·1		..	..	..	..	..	400	2
3·0	12·0	186·0	..	40·0	2·0	..	..	..	..	..	..	..	440	3

[contd. overleaf. Notes on pages 436-9

TABLE I (*contd.*)

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butte
	Total[b]	Wheat-flour[h]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Ireland (*contd.*):												
Farm workers' families 1946-48	..	118·1	5·6	..	14·6	..	..	..	112	0·6	11·6	..
	..	125·3	9·7	..	22·2	..	..	..	164	0·9	12·5	..
	..	133·7	9·9	..	35·5	..	..	..	174	1·6	14·6	..
	..	142·7	9·6	..	46·0	..	..	..	221	2·9	15·5	..
	..	140·6	10·0	..	69·1	..	..	..	221	1·9	14·9	..
Italy:												
1925–29	176·3 [1]	142·5 [1]	..	33·8 [1]	..	11·0	5·8	1·5 [3]	75	4·6	..	1·1
1930–34	140·5 [2]	124·6 [2]	..	15·9 [2]	..	9·2	4·5	1·2 [3]	84	4·8	..	1·0
1934–38	163·9	126·0	8·1	29·8	19·6	8·6	5·2	1·2	74	5·2	12·0	1·3
1947/48–48/49	152·4	122·3	8·1	22·0	15·6	5·4	4·9	1·3	..	4·7	10·0	0·9
1950/51–52/53	154·0	..	5·4 [4]	..	17·0	..	..	..	92	5·8 [4]	..	1·1 [4]
Japan:												
1928	217·0	..	..	..	2·6	..	..	..	1·5	..	..	..
1934–38	168·0	9·7	134·2	24·1	3·8	1·1	1·1	..	4·5	..	1·8	..
1947/48–48/49	142·5	21·5	104·7	16·3	1·5	0·6	0·1	..	2·5	..	0·5	..
1950/51–52/53	153·0	..	..	..	2·0	..	..	..	7·0	..	1·0	..
Mexico:												
1930	..	..	..	..	15·3	10·6	3·5	0·4	..	..	..	..
1934–38	109·0	..	..	..	25·0	..	..	..	86	..	5·0	..
1940	..	..	..	..	16·9	11·6	4·3	0·4	..	..	..	..
1946–49	123·0	..	..	..	23·0	..	..	..	71	..	6·0	..
Netherlands:												
1925–29	..	..	..	..	..	17·6	17·1	0·9	..	5·2	..	5·6
1930–34	..	..	..	..	..	16·4	20·5	0·7	187	6·4	..	7·5
1933–37	102·0	81·0	..	21·0	39·0	..	..	..	..	7·2	20	6·3
1934–38	98·4	77·8	5·1	15·5	39·6	17·1	16·9	1·1	200	6·6	21	5·6
1947/48–48/49	103·8	76·8	1·2	25·8	22·3	12·0	8·0	0·4	..	6·3	..	..
1950/51–52/53	97·3	..	..	..	31·7	..	..	..	204	..	26	..
New Zealand:												
1925–29	..	..	..	..	..	57·2	11·3	33·8	152	2·4	..	14·8
1930–34	..	..	..	..	..	49·9	10·5	39·7	150	3·9	..	17·1
1935–39	86·7	79·8	2·4	4·5	109·3	57·6	13·0	32·9	220	3·2	17	19·2
1947–48	91·2	85·4	0·8	5·0	95·9	43·2	13·9	31·1	..	2·7	..	13·4
1950–52	86·7	..	..	..	107·7	..	..	..	..	..	19	19·0
Norway:												
1925–29	..	..	..	..	..	13·4	10·0	5·3	..	..	..	..
1930–34	..	..	..	..	..	13·8	11·6	5·2	..	..	..	..
1934–38	119·0	69·7	1·7	47·6	37·9	14·8	14·1	5·5	251	5·5	25	7·9
1947/48–48/49	117·6	..	..	..	26·8	12·2	7·4	4·3	..	4·2	..	5·3
1950/51–52/53	109·3	..	..	..	34·7	..	..	..	341	..	25	..
Workers' households 1927–28	94·0	27·0	..	67·0	25·2	6·5	3·1	1·7	229	5·3	17	1·1
	91·0	33·0	..	58·0	34·3	8·8	6·6	2·5	301	6·5	18	2·8
	92·0	33·0	..	59·0	40·2	10·1	8·8	3·4	349	8·1	21	6·5
	88·0	32·0	..	56·0	45·8	13·0	9·6	3·3	381	9·0	20	9·1

AT VARIOUS INCOME LEVELS

per Head [a]

Fish[j]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[g]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
0·7	5·4	164·2	16·4	16·8	..	1·9		..	..	..	..	..	68	21
2·1	7·8	175·5	28·9	17·5	..	6·8		..	..	..	..	..	113	21
1·5	13·2	222·3	38·8	18·3	..	5·6		..	..	..	..	..	159	21
4·1	13·2	182·0	34·9	18·4	..	7·8		..	..	..	..	..	227	21
3·4	15·6	296·6	64·3	17·7	..	7·8		..	..	..	..	..	340	21
5·1 [1]	6·4	35·0 [1]	36·0	9·0	..	18·0		..	0·9 [1]	..	..	110 [1]	190	7, 22
5·4 [2]	6·8	35·0 [3]	42·0	7·8	..	19·0		..	0·7 [2]	..	..	94 [3]	164	7, 22
5·9	7·6	36·6	55·8	7·1	22·3	27·9		..	..	..	..	84	..	2
5·8	5·1	37·7	74·5	8·1	14·3	36·4		..	..	..	..	..	206	2
6·0	7·0	37·0	88·6 [4]	14·0	15·0	50·7 [4]		..	..	..	..	..	253	3, 23
39·6	1·9	133·0 [1]	70·0 [2]	13·0	..	13·0		..	..	..	..	..	190	24
35·3	2·9	62·8	79·2	14·4	7·7	5·3	11·1	..	..	..	..	..	221	2
28·8	0·5	58·0	67·1	4·6	2·3	3·3	5·5	..	..	..	..	..	170	2
18·0	2·0	60·7	..	8·0	5·0	..	..	..	..	..	..	..	214	3
..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
1·0	3·0	5·0	..	18·0	9·0	43·0		..	..	..	..	..	..	26
..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
2·0	2·0	7·0	24·0	26·0	10·0	58·0		..	..	..	..	..	..	26
..	..	..	..	31·0	.	..	..	..	..	..	..	..	412	7
..	5·7	..	..	29·0	..	..	..	..	..	..	..	..	408	7
11·0	7·4	130·0	57·0	34·0 [1]	..	56·0		..	..	..	..	..	415	25
8·0	5·8	132·6	64·0	33·5	6·6	41·7		..	..	..	15·1	1·0	428	2
11·0	5·1	152·0	71·0	32·7	3·5	37·4		..	..	..	..	..	468	2
10·0	5·3	126·0	..	35·7	4·0	..	..	..	..	..	..	..	503	3
..	..	..	..	54·0 [1]	..	..	..	..	..	..	..	..	588	7
..	..	..	..	47·5 [2]	..	5·4 [3]	28·1 [3]	..	..	..	..	..	574	7
11·7	13·4	49·8	65·0	48·2	2·9	66·6		..	..	..	..	..	716	2
11·2	12·3	47·6	64·9	47·2	3·6	55·4		..	..	..	..	..	815	2
9·3	11·0	47·3	..	46·7	4·7	..	..	..	..	..	..	..	890	3
..	6·1	..	..	28·9	..	5·0	23·0	..	..	..	..	..	314	7
..	7·1	..	..	30·2	..	7·0	24·0	..	..	..	..	..	315	7
21·0	6·9	121·8	19·3	30·3	3·1	10·0	23·0	..	..	..	..	..	361	2
27·3	5·2	129·5	31·7	22·3	2·9	3·0	21·0	..	..	..	..	..	426	2
43·0	6·7	114·7	..	27·3	2·7	..	..	..	..	..	..	..	478	3
39·4	3·6	72·0	8·2	18·0	..	7·8		0·06	..	..	..	..	138	9
38·5	5·7	72·0	10·0	21·0	..	12·1		0·06	..	..	..	..	202	9
40·4	9·2	79·0	12·6	23·0	..	19·8		0·09	..	..	..	..	275	9
41·0	10·8	85·0	15·2	23·0	..	22·9		0·12	..	..	..	..	349	9

[contd. overleaf. Notes on pages 436-

TABLE I (*contd.*)

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butt
	Total[b]	Wheat-flour[a]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Peru:												
1935–39	98·2	27·3	11·3	59·6	24·0	8·8	6·2	5·8	39	1·1	4	0·3
1947	102·6	29·2	15·0	58·4	22·6	8·2	5·1	6·3	40	1·0	4	0·4
1952	103·0	..	..	..	20·0	..	..	..	40	..	6	..
Philippines:												
1934–38	127·7	5·3	96·6	25·8	16·6	2·4	8·3	0·1	7	0·1	3	0·1
1952–53	131·0	..	..	..	12·0	..	..	..	10	..	3	..
Poland:												
1925–29	..	..	..	..	..	6·5	9·7	0·3	181[1]	..	..	..
1930–34	..	..	..	..	..	6·9	9·9	0·3	227[1]	..	..	..
1934–38	134·2	31·4	1·2	101·6	26·0	7·7	15·6	0·3	135	2·0	7	3·5
1947/48–48/49	137·4	39·1	..	98·3	17·8	3·9	11·4	0·4	..	1·9	6	2·1
Workers' households 1929	126·0	28·0	..	98·0	26·6	8·1	8·3	0·1	67	1·5	2	1·5
	139·0	29·0	..	110·0	35·3	12·5	14·8	0·3	94	1·3	3	2·1
	148·0	48·0	..	100·0	44·0	16·0	18·0	0·8	116	1·7	5	3·2
	137·0	47·0	..	90·0	57·6	27·0	21·9	1·0	143	1·9	6	4·
Portugal:												
1933/34–37/38	127·4	59·9	8·1	59·4	20·6	3·8	10·4	2·7	25	1·2	12·7	0·
1948/49–49/50	123·8	61·8	7·4	54·6	18·5	4·1	8·6	2·5	24	1·3	12·3	0·
Southern Rhodesia:												
1950–52	174·0	..	..	..	30·0	..	..	..	36	..	2	..
Sweden:												
1925–29	..	..	..	..	43·6	..	..	..	..	..	..	8·
1930–34	..	..	..	..	46·9	..	..	..	..	..	..	10·
1934–38	95·4	57·9	1·9	35·6	49·0	21·1	21·7	0·8	302	5·6	18	11·
1947/48–48/49	84·0	50·8	0·1	33·1	42·8	16·8	20·6	0·5	..	7·4	18	13·
1950/51–52/53	88·0	..	..	..	50·0	..	..	..	308	..	20	..
Workers' and lower salaried employees' households 1933	84·0	..	..	..	31·9	7·8	10·5	0·2	249	4·5	14	6·4
	78·0	..	..	..	40·0	9·7	12·5	0·4	317	5·3	16	11·4
	72·0	..	..	..	51·8	11·3	14·0	0·8	359	5·6	18	15·
Switzerland:												
1911	..	..	..	..	52·0	..	..	..	356	11·1	..	5·1
1925–29	..	..	..	..	..	24·0[1]	16·6[1]	0·6[1]	427	9·9	..	5·
1930–34	..	..	..	..	..	24·0	19·4	0·6	402	8·4	..	6·
1934–38	110·0	98·6	4·0	7·4	56·2	22·0	21·4	0·5	328	6·9	16	6·
1947/48–48/49	114·4	88·8	3·8	21·8	39·0	17·3	12·9	0·4	..	8·7	15	6·
1950/51–52/53	113·0	..	..	..	47·0	..	..	..	323	..	15	..
Turkey:												
1934–38	190·9	127·3	2·7	60·9	17·5	6·7	..	6·9	25	0·7	6	1·
1950/51–52/53	193·0	..	..	..	16·0	..	..	..	31	..	7	..

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[g]	Pulses and Nuts	Fruit		Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
						Citrus	Other							
0·9	3·2	108·9	13·6	12·3	15·6	42·4		..	..	..	..	..	..	2
1·3	3·3	122·0	14·0	19·8	6·9	4·1	38·5	..	..	..	..	..	109	2
4·0	3·0	169·0	..	22·0	9·0	..	..	..	..	..	..	..	150	3
48·4	2·8	25·9	14·8	8·6	17·2	0·8	60·6	..	..	0·2	..	..	..	2
..	3·0	51·0	..	12·0	12·0	..	..	..	..	..	..	..	..	3
..	5·4	..	..	11·6	..	0·6	..	..	..	..	..	..	141	7
..	6·3	..	..	9·9	..	0·5	..	..	..	..	..	..	..	7
2·0	3·7	285·0	37·7	9·0	9·3	31·4		..	..	..	..	..	160	2
3·5	4·3	257·0	..	14·4	..	..	..	..	..	..	..	..	..	2
5·4	1·3	149·0	25·3	12·1	..	2·9		0·14	..	0·03	..	..	73	9
4·2	1·9	182·0	40·5	16·4	..	4·5		0·13	..	0·05	..	..	125	9
3·0	3·3	161·0	48·8	19·5	..	6·6		0·14	..	0·01	..	..	182	9
3·5	6·1	185·0	60·0	23·4	..	9·4		0·20	..	0·07	..	..	247	9
34·1	2·7	74·7	59·3	8·7	15·5	54·7		..	..	..	..	..	125	27
32·8	2·3	102·2	56·0	10·9	13·8	48·8		..	..	..	..	..	137	27
2·0	1·0	10·0	..	12·0	12·0	..	..	..	..	..	..	..	..	3
..	..	..	..	34·9	..	..	..	..	..	..	..	..	327	7, 28
..	..	..	..	40·9	..	..	..	..	..	..	..	..	341	7, 28
20·0	8·3	122·2	21·1	42·7	3·5	6·3	30·5	..	..	..	21·9	1·0	415	2
22·6	11·0	131·8	22·6	39·3	2·9	7·9	30·0	..	..	..	23·4[1]	1·3[1]	580	2
20·0	10·0	115·0	..	42·0	3·0	..	..	..	..	..	..	..	641	3
11·1	7·7	86·0	6·4	28·4	..	18·0		0·05	..	0·3	..	..	159	9
14·7	11·2	92·0	10·8	33·2	..	27·0		0·05	..	0·4	..	..	252	9
16·8	13·0	95·0	16·8	36·8	..	35·0		0·08	..	0·3	..	..	399	9
..	5·7	127·0	..	23·7	..	3·4	..	..	2·8	..	..	56·0	290	7
..	7·5	..	..	37·9	..	5·2	57·0	..	..	..	..	..	399	7
..	8·9	..	..	42·2	..	8·4	56·0	..	..	..	..	..	421	7
1·0	8·8	90·5	61·9	38·1	2·6	85·7		..	..	..	54·0	34·3	426	2
1·8	7·4	103·9	75·2	36·7	6·6	119·8		..	..	..	40·0[2]	34·8[2]	614	2
2·0	9·0	83·0	..	38·0	9·0	..	..	..	..	..	..	..	645	3
4·0	3·1	3·3	52·5	4·6	10·2	1·0	97·4	..	..	..	..	0·5	..	2
2·0	1·0	24·0	..	7·0	11·0	..	..	..	..	..	..	..	..	3

[contd. overleaf. Notes on pages 436-9

CONSUMPTION OF FOODSTUFFS

Kilos per Year

	Cereals				Meat				Milk[d]	Cheese	Fats and Oils (Fat content)	Butter
	Total[b]	Wheat-flour[h]	Rice	Other	Total[c]	Beef and Veal	Pig-meat	Mutton and Lamb				
Union of South Africa:												
1935–39	155·7	29·6	6·6	119·5	37·8	22·1	3·5	11·2	76	0·4	3	1·4
1947–48	153·0	35·4	1·5	116·1	43·2	30·4	3·5	8·5	83	0·7	4	2·0
1950–52	161·0	..	..	..	40·0	..	..	..	79	..	5	..
United Kingdom:												
1880	..	127·0	..	..	38·0	..	..	..	154	3·6	..	5·4
1909–13	..	96·0	..	..	51·0	..	..	..	147	3·0	15	7·0
1925–29	..	90·0[1]	..	..	..	29·6	16·7	11·6	154	4·0	..	7·4
1930–34	..	..	..	..	..	27·4	18·6	13·1	159	..	..	10·0
1934–38	94·2	89·0	2·0	3·2	60·4	24·8	17·6	11·4	152	4·0	21	11·2
1947/48–48/49	111·4	105·2	0·5	5·7	44·8	20·8	7·2	10·3	..	4·1	..	4·9
1950–52	100·3	92·5	1·2	6·6	48·3	17·1	12·2	9·4	209	4·3	21	6·4
1935	69·0	..	..	..	34·0	15·0	14·0[2]	5·0	74	2·7	13	4·4
	72·0	..	..	..	47·0	21·0	17·0[2]	8·0	108	3·7	17	9·6
	72·0	..	..	..	55·0	25·0	19·0[2]	11·0	128	4·6	18	11·1
	71·0	..	..	..	61·0	28·0	19·0[2]	14·0	147	5·3	19	12·5
	69·0	..	..	..	66·0	29·0	20·0[2]	17·0	177	5·3	19	14·0
	63·0	..	..	..	73·0	28·0	25·0[2]	20·0	199	3·8	20	16·2
United States:												
1910–14	128·5	95·6	3·1	29·8	70·3	26·0	27·5	2·9	183	2·1	16·7	7·8
1915–19	119·9	88·1	3·9	27·9	67·1	24·7	26·6	2·1	185	2·1	17·4	7·1
1920–24	106·9	80·7	2·5	23·7	68·1	24·0	28·5	2·2	189	2·2	17·4	7·5
1925–29	106·2	81·9	2·5	21·8	65·7	22·3	28·2	2·1	193	2·5	19·4	8·0
1930–34	97·9	75·5	2·4	20·0	65·2	21·3	28·4	2·7	195	2·6	19·6	8·1
1935–39	91·4	72·9	2·6	15·9	61·6[5]	23·0	23·5	2·7	203[6]	3·2	20·2	7·6
1945–49	81·2	66·7	2·1	12·4	74·8	26·6	28·9	2·3	244	4·4	18·4	4·8
1950–52	74·8	61·1	2·4	11·3	73·7	24·4	29·6	1·5	240	5·1	19·7	4·4
1942	97·3	..	..	..	27·1[2]	..	..	..	189	..	..	..
	87·6	..	..	..	36·2[2]	..	..	..	171	..	..	..
	73·8	..	..	..	40·5[2]	..	..	..	174	..	..	..
	65·8	..	..	..	46·3[2]	..	..	..	191	..	..	..
	64·7	..	..	..	56·5[2]	..	..	..	179	..	..	..
	59·1	..	..	..	62·8[2]	..	..	..	183	..	..	..
Uruguay:												
1935–39	85·2	75·9	4·8	4·5	100·6	61·0	7·7	26·4	..	2·4	12	0·5
1947–48	96·4	82·6	8·5	5·3	102·8	53·5	6·3	33·5	..	2·6	10	0·5
1952	94·0	..	..	..	126·0	..	..	..	170	..	15	..
Venezuela:												
1949–51	86·0	..	..	..	19·0	..	..	..	112	..	6	..
Yugoslavia:												
1934–38	228·5	92·5	1·6	134·4	22·7	6·0	7·7	5·6	133	3·1	6	3·6
1947/48	175·7	81·9	..	93·8	15·2	2·7	8·2	2·0	..	1·3	..	2·2
1950/51–52/53	183·0	..	..	..	20·0	..	..	..	99	..	9	..

AT VARIOUS INCOME LEVELS

per Head [a]

Fish[f]	Eggs[e]	Potatoes[f]	Vegetables (excluding Potatoes)	Sugar[e]	Pulses and Nuts	Fruit: Citrus	Fruit: Other	Tea	Coffee	Cocoa	Beer	Wine	Real Income, I.U. per head per annum	Source
3·3	1·8	15·7	25·5	23·0	2·2	3·6	13·0	..	..	..	..	..	201	2
4·3	2·0	17·7	32·2	40·6	3·8	5·8	13·4	..	..	..	..	..	243	2
7·0	3·0	15·0	..	40·0	4·0	..	..	..	..	..	..	..	264	3
..	5·0	134·0	..	29·0	..	..	..	..	..	..	..	..	337	29
..	6·0	87·0	27·0	34·0	..	28·0		3·0	0·3	0·5	..	..	516	30
..	8·5	88·0	35·0[1]	45·0	..	10·0	24·0	..	..	..	..	..	526	7
..	9·8	..	..	47·0	..	13·0	26·0	..	..	..	..	..	539	7
12·1	10·9	78·6	48·7	42·0	4·4	14·0	42·0	4·2	0·3	..	..	..	612	2
13·4	9·7	111·2	61·5	38·4	4·9	40·0	..	3·8	0·8	..	..	..	593	2
10·4	12·9	109·5	57·2	38·1	4·7	8·0	49·0	3·8	0·7	0·6	..	..	600	31
3·9	4·5	78·0	24·0	32·0	..	24·0		3·2	..	..	..	..	116	9
8·1	6·2	83·0	29·0	37·0	..	36·0		4·0	..	..	..	..	193	9
12·1	7·7	85·0	40·0	42·0	..	42·0		4·3	..	..	..	..	270	9
15·3	9·5	84·0	45·0	45·0	..	45·0		4·4	..	..	..	..	386	9
18·0	10·7	84·0	48·0	47·0	..	49·0		4·3	..	..	..	..	579	9
19·9	13·4	80·0	50·0	48·0	..	62·0		4·0	..	..	..	..	811	9
5·2	16·8	86·2	109·2	35·5	7·2	8·2	56·6	0·4	3·5	0·5[1]	..	..	530	31
5·0	16·1	80·6	108·4	35·7	7·2	9·1	51·7	0·5	4·2	1·0[1]	..	..	534	31
5·0	17·0	76·8	114·8	42·8	6·6	12·5	51·9	0·4	4·5	1·0[1]	..	..	588	31
5·3	18·1	71·5	116·9	48·3	7·4	13·8	53·6	0·3	4·4	1·1[1]	..	..	685	31
4·1	16·9	66·7	119·2	46·4	7·5	16·3	47·4	0·3	4·7	1·1[1]	..	..	557	31
4·9	16·3	64·0	122·5	45·1	8·3	21·9	51·4	0·3	5·3	1·5[1]	..	..	672	31
4·6	21·1	56·0	134·9	40·6	8·1	30·2	47·0	0·3	6·8	1·3[1]	..	..	1040	31
5·1	22·4	48·5	123·6	45·3	8·2	26·6	44·8	0·3	6·2	1·4[1]	..	..	1109	31
..	16·5	55·6	111·0[3]	23·8[4]	9·9	..	..	..	..	..	..	..	101	32
..	17·8	56·5	131·0[3]	22·8[4]	8·2	..	..	..	..	..	..	..	181	32
..	19·6	62·5	144·0[3]	21·4[4]	8·9	..	..	..	..	..	..	..	283	32
..	21·9	60·3	157·0[3]	19·5[4]	6·1	..	..	..	..	..	..	..	406	32
..	21·6	57·1	184·0[3]	19·8[4]	5·8	..	..	..	..	..	..	..	556	32
..	20·0	53·8	198·0[3]	17·9[4]	4·7	..	..	..	..	..	..	..	704	32
1·9	7·4	39·5	9·8	24·0	2·5	14·4	14·9	..	..	..	6·7	26·9	..	2
2·2	8·2	40·6	13·9	29·0	2·0	21·8	17·8	..	..	..	7·4	27·0	..	2
2·0	6·0	60·0	..	32·0	1·0	..	..	..	..	..	..	..	..	3
13·0	3·0	56·0	..	39·0	15·0	..	..	..	..	..	..	..	..	3
0·2	2·1	55·1	58·9	4·5	7·2	29·7		..	..	..	..	26·0	..	2
0·6	2·2	10·4	40·0	3·7	3·8	30·0		..	..	..	..	..	..	2
1·0	3·0	37·0	..	7·0	9·0	..	..	..	..	..	..	..	..	3

[*Notes for Table I on following 4 pages*

NOTES FOR TABLE I

[a] Where given as "man equivalents" converted back by the factor 0·85.

[b] In terms of flour and milled rice. 1·4 kilos bread = 1 kilo flour. Cakes and biscuits assumed to contain 50 per cent flour, 10 per cent fat, 10 per cent sugar.

[c] Including offal and poultry. Most pre-war meat figures have been reduced to exclude carcass fats.

[d] Whole milk used for fresh consumption and for other dairy products except butter.

[e] 17·5 eggs = 1 kilogram.

[f] Includes sweet potatoes, cassava, etc.

[g] In terms of refined sugar, excluding syrup and honey. Refined sugar = 95 per cent raw sugar. Jam apportioned 50 per cent sugar, 50 per cent fruit.

[h] Wheat flour consumption (Wheat Studies, Stanford University, June 1930 and March 1935). Extraction rate taken at 75 per cent. Further data:

	Spain	Portugal	U.K.	France	Belgium	Netherlands
Kg. per head per year:						
1885–89	94	38	111	156	104	69
1909–14	115	31	116	164	148	81

	Switzerland	Italy	Germany	Norway	Denmark	Sweden	Finland
Kg. per head per year:							
1885–89	105	104	38	14	29	20	9
1909–14	115	122	55	33	57	43	35

[i] Consumption of butter and margarine (*Weltwirtschaftliches Archiv*, 1949, Heft 2) kg. per head per annum:

	1913		1928		1938		1947	
	Butter	Margarine	Butter	Margarine	Butter	Margarine	Butter	Margarine
Germany	6·8	3·0	7·1	7·4	8·8	6·1	3·6	3·6
Netherlands	7·6	4·8	5·8	8·4	5·7	7·1	5·0	7·7
Great Britain	7·7	2·8	7·7	4·0	11·3	4·0	5·0	7·0
Denmark	8·8	15·8	5·4	22·0	8·3	21·5	9·0	5·0
Belgium	..	..	7·0	4·8	9·0	7·6	7·0	6·0
U.S.A.	8·2	0·5	7·9	1·4	7·7	1·5	7·0	3·0

[j] Consumption of fish (U.N. Formulation and Economic Appraisal of Development Projects) kg. per head per annum:

Ceylon	China	Pakistan	Indo-China	Indonesia	Japan	Malaya	Philippines	Singapore	Thailand
15·2	6·1	2·4	8·5	8·4	76·9	11·1	19·1	18·5	9·9

Australia. [1] 1925–30.

Austria. [1] 1934. [2] 1927–29. [3] 1931–32.

Canada. [1] Fresh milk. [2] White sugar. [3] Godfrey (*J.R.S.S.*, 1920) estimated 311 for 1911, including milk sucked by calves (possibly 20 per cent of whole).

China. [1] Conversion factor for cereals to flour taken at 1·3. The original data were not added or averaged. A sample of villages has been extracted for each region. The regional differences are extremely marked. [2] Figures "per consumption unit" divided by 1·3 to convert to per head basis. Cereal consumption also divided by 1·3 to reduce to flour (if the figures contained an appreciable quantity of milled rice, this method will understate the true consumption).

Denmark. [1] Includes mutton and lamb. [2] 1947–48.

Egypt. [1] Data from Egyptian Ministry of Finance, 1947, kg. per head per year:

	1914–16	1926–28	1936–38
Pop. (mill.)	12·49	14·28	15·97
Wheat	72·0	82·8	69·8
Barley	20·2	15·5	12·8
Maize	134·0	132·8	97·3
Rice	11·5	13·5	17·5
Millet	24·2	20·9	27·2
Beans	22·7	18·4	16·6
Lentils	1·8	2·6	2·9
Peanuts	0·7	1·0	1·2

Finland. [1] 1927–28. [2] 1932–33.

France. [1] Rye. [2] 1927–29.

Germany. [1] Rye. [2] Includes rye. [3] Includes goat.

India and Pakistan. [1] Report on Marketing of Milk in India and Burma, consumption of milk and milk products. Urban consumption 130 kilos, of which 92 kilos milk equivalent of butter and other products. Burmese consumption 19 kilos per head only. Indian milk is largely obtained from buffaloes and has a fat content 60 per cent higher than European. The Report on Marketing of Milk gives the following data for Lahore, 1939:

Family Income (I.U. per year)	120	256	516	1026	2394	5130
Milk consumption (kg. per family per year)	372	1212	1584	1788	2112	2640

[2] Includes fish. [3] Consumption of tea in Calcutta, 1939 (Mahalanobis, *Sankhya*, 1943):

Total Expenditure (I.U. per head per annum)	56	59	87	118	129	140	150	181	224	218	484
Consumption of tea (kg. per head per annum)	1·2	1·9	2·1	2·3	2·4	2·3	1·9	2·3	2·3	2·2	2·7

[4] The following income elasticities of demand were computed for Bombay in 1939 (*Sankhya,* vol. 4, Pt. IV):

Cereals and Pulses	Vegetables	Fish and Meat	Milk and Ghee	Sugar	Tea and Coffee
0·17	0·28	0·99	1·93	1·36	2·00

Pakistan. [1] Includes milk for making butter and ghee. [2] Excludes butter and ghee.

Indo-China. [1] Poorer peasant families (data from Gourou, 9th Conference, Institute of Pacific Relations) with an average of 5·2 persons living on less than a hectare of land consume:

	Rice	Potatoes	Fish	Soya Beans	Vege-tables
Kg. per head per annum	187	44	19	3	42

Italy. [1] 1926–30. [2] 1931–36. [3] Includes goat. [4] 1951/52–52/53.

Japan. [1] All root vegetables. [2] Excluding root vegetables.

Netherlands. [1] Data from Netherlands family budget study of 1935–36:

Real Income (I.U. per head per annum)	186	250	284	365	505	800	1580
Sugar consumption (kg. per head per annum)	18·3	20·8	20·7	23·0	24·1	28·6	31·6

New Zealand. [1] 1926. [2] 1931–34. [3] 1932–34.

Poland. [1] Includes milk equivalent of butter.

Sweden. [1] 1947–48.

Switzerland. [1] 1926–29. [2] 1948–49.

United Kingdom. [1] 1924–28. [2] Includes sausages and other meat products.

United States. [1] Chocolate liquid equivalent of cocoa and chocolate. [2] Includes fish. [3] Includes fruit. [4] Includes syrups. [5] U.S. consumption of meat, sample inquiry in Syracuse, 1942 (*Farm Economics,* April 1943):

Yearly consumption expenditure (I.U. per head)	159	254	338	434	569	837
Average price (cents per lb.)	29	31	33	34	36	38
Meat consumption (kg. per head per annum)	39	55	60	62	65	78

[6] Consumption of fresh milk or evaporated equivalent, Ithaca, 1940 (*Farm Economics,* June 1942):

Family Income (I.U. per head per annum)	252	504	841	1233
Fresh milk (kg. per head per annum)	125	189	219	250
Evaporated (kg. per head per annum)	49	40	27	12

Sources

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2. F.A.O. Food Balance Sheet.
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contd. from p. 421]

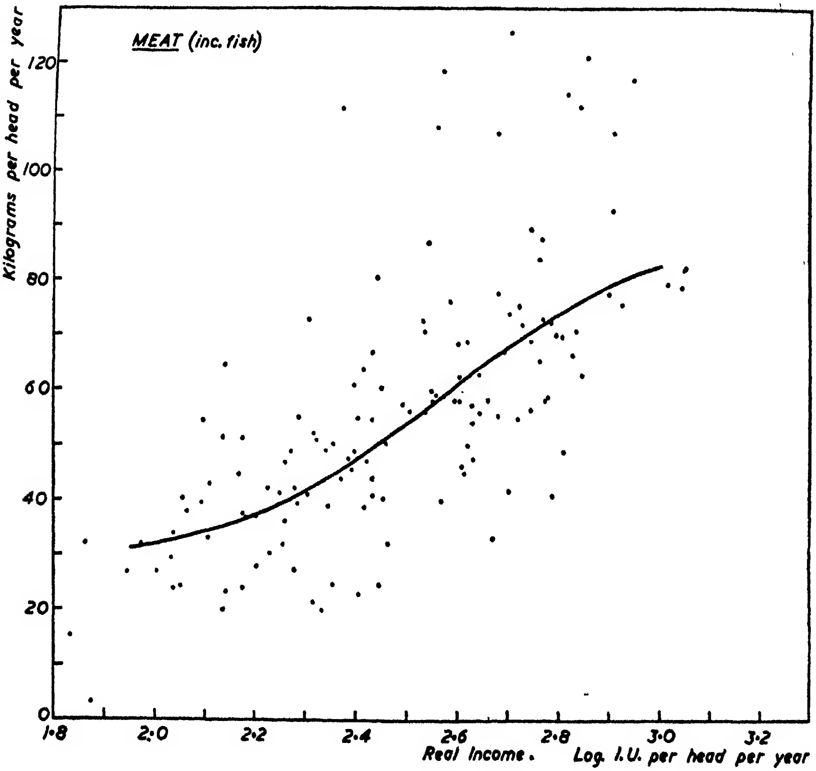
The diagrams when plotted show a wide dispersal of results, but on the whole bear out the hypothesis of a very gently inflected S-shaped curve.

The principal deviations above the line in the case of sugar are, at the high-income levels, Australia and Denmark ; and at the low-income levels, Cuba and Colombia, which are sugar-producing countries. The U.K., where sugar is cheap, is generally above the line. The deviations below the line are mostly countries where sugar is heavily taxed.

In the case of meat and fish, exceptionally high consumption figures are shown by Argentine, Australia, New Zealand and Norway, low figures by India and Italy.

In butter, quite extraordinarily low figures have been shown by U.S. in the past decade. The high figures come

DIAGRAM I

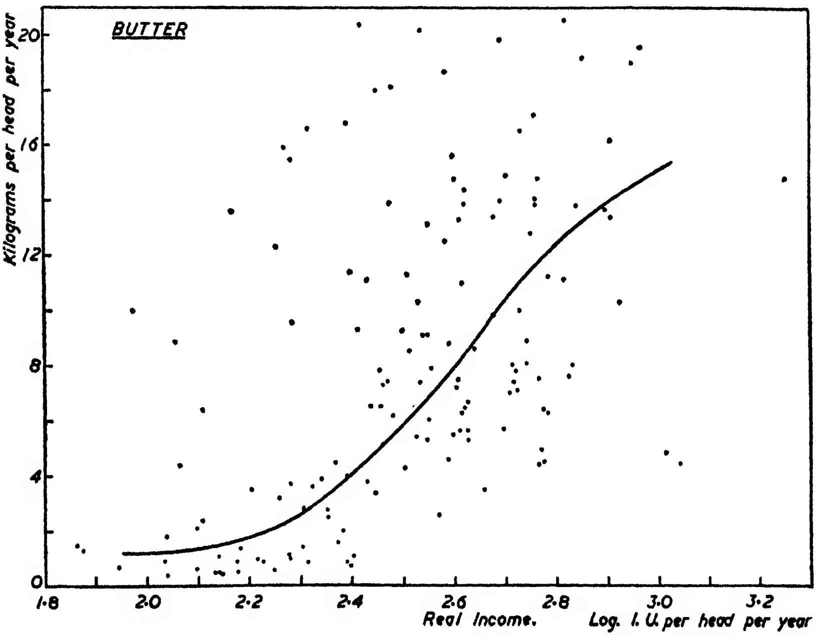


from Australia, Belgium, Finland and New Zealand, with U.K. fairly high. In these countries demand for butter rises rapidly at low-income levels, and reaches saturation so much the sooner.

For milk, there are some very high figures in the top left-hand corner for consumption in the Scandinavian

countries, where milk has always been cheap and abundant. Cheese appears to be a saturated demand, in relation to income. Demand for eggs on the other hand shows a very marked response to income change. In the case of fruit, there are a few low-income tropical countries where fruit is cheap and abundant. But apart from them, the

DIAGRAM II



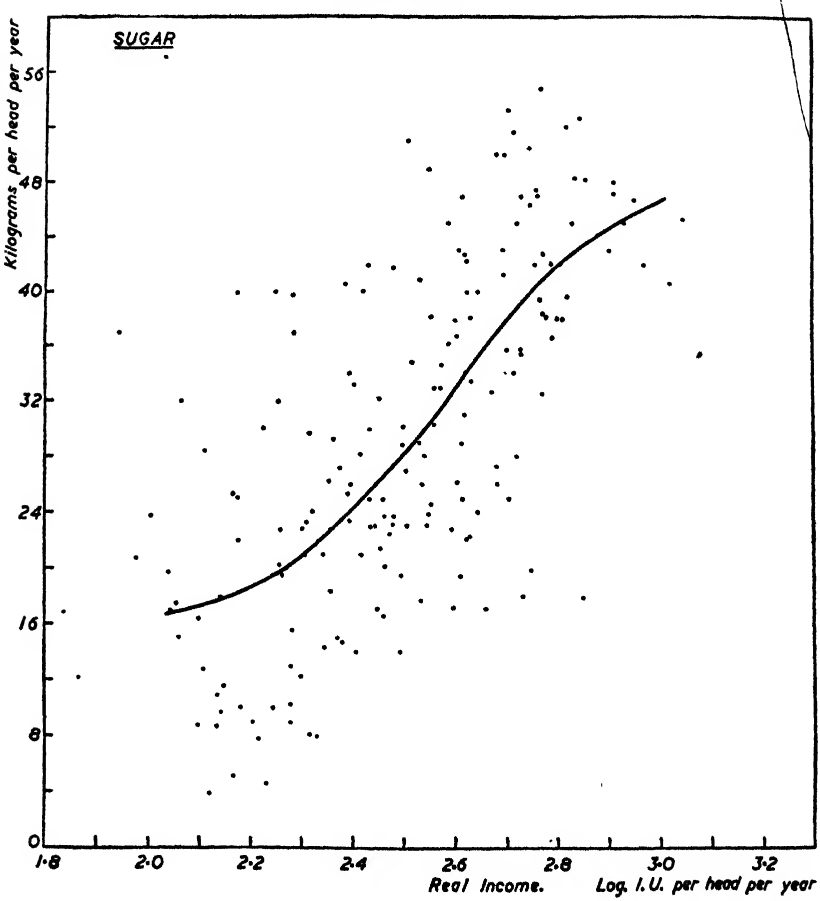
demand curve rises with income at a rate which still appears to be accelerating.

We can make somewhat more precise studies[1] of consumption of farm products (including non-edible products such as wool and hides) in the aggregate from national aggregates of agricultural and fishery product expressed in

[1] The writer is grateful to the Council of the Royal Statistical Society for their consent to the reprinting of some parts of his paper contributed to the *Journal of the Royal Statistical Society*, Part III, 1954.

I.U. terms, already computed in Chapter V, to which we add the I.U. values of imports and deduct the I.U. values of exports of the same products.

DIAGRAM III



A further refinement (not attempted at this stage) would be to make an allowance for the small quantities of farm products incorporated in imports and exports of made-up textile goods, and one or two other finished manufactures.

DIAGRAM IV

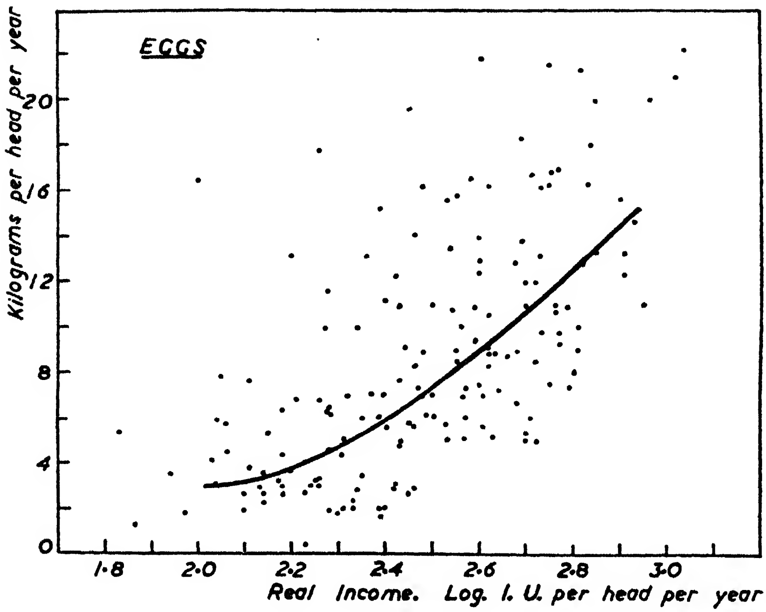
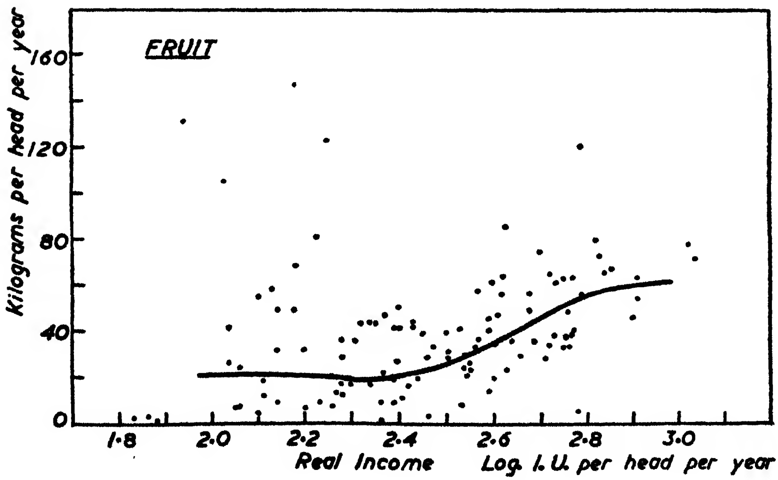
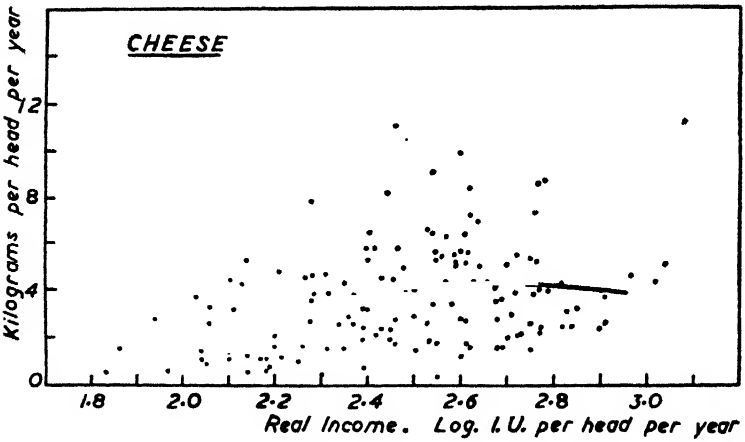


DIAGRAM V



The obvious procedure is to reduce these consumption figures to a per-head basis, and then express them as a function of real national income per head. These latter figures, from Chapter III, refer to national income per head of the total population, and not merely of the working population; to *available* rather than *produced* income in countries where those figures differ appreciably; and include the imputed income of farm populations in respect of the home-grown foods which they consume, valued at retail.

DIAGRAM VI



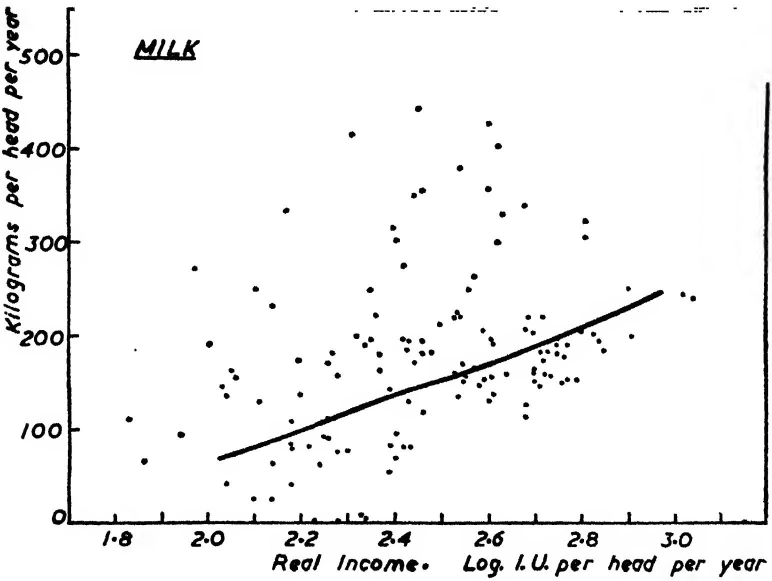
To analyse the possible effect of prices on consumption, the price of a "standard ration" of foodstuffs in each country was stated in terms of the number of I.U. of "goods in general" which had to be foregone to buy such a ration. (The base of this series is arbitrary.)

It was decided to pool the results[1] for 1934–38 and 1950–51. They were carefully examined by Mr. A. G. Antill, Demonstrator in Statistics at the Agricultural Eco-

[1] The calculations omitted the very high figures for Norway (which consumes, at a low local price, a great deal of fish to which a high world price is imputed); the exceptional figures for Greece and Japan; and the low and uncertain figures for Brazil, Colombia and Cuba.

nomics Research Institute, who found that the best fit was a hyperbola of somewhat unusual form, as indicated on Diagram VIII. We had long been familiar with Adam Smith's generalisation that "the desire for food is limited in every man by the narrow capacity of the human stomach"; but it is interesting to have this re-stated as a definite asymptote. In a country with indefinitely high income,

DIAGRAM VII



according to this relationship, consumption of farm products would not go beyond 114 I.U. per head per year. (This of course measures the products at farm, not retail value.) A hyperbola of this nature involves not a constant, but a rapidly declining income elasticity of demand.

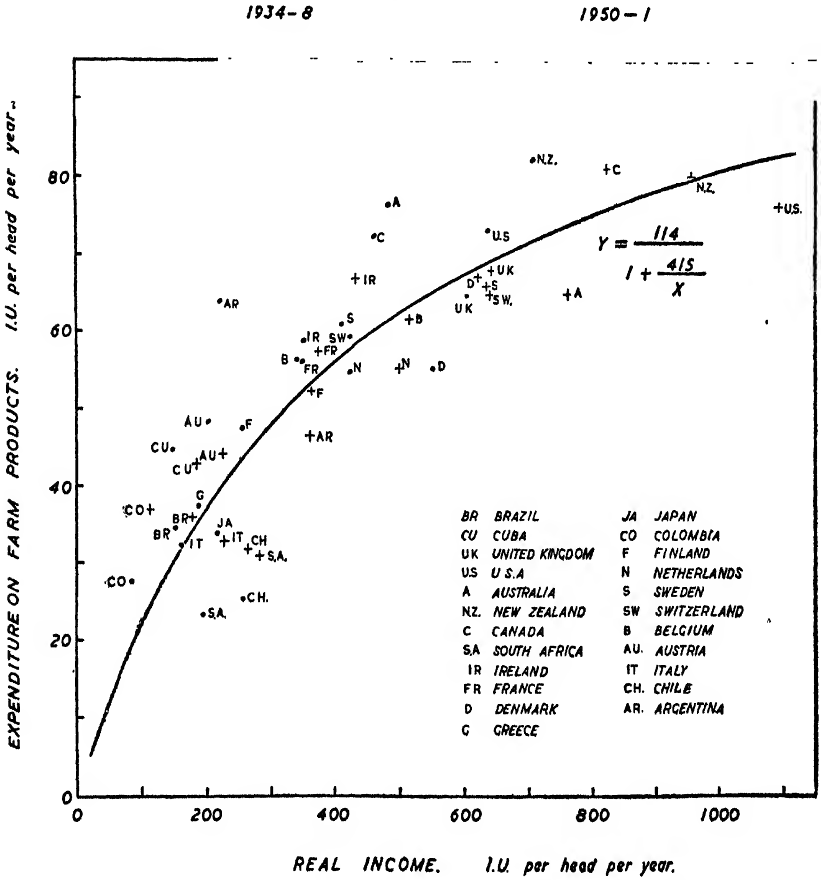
The hyperbola is still not very clearly defined and there are obviously some significant deviations. The first hypothesis which should be tried out is that the deviations are related to the price of food. The data for this analysis are given in Table II.

TABLE II

	Apparent Consumption		1934–38			1950–51		
	1934–38 (million I.U.)	1950–51 (million I.U.)	Expenditure per Head on Farm Products (I.U.s)	Real Income per Head (I.U.s)	Price of Standard Ration (I.U.s)	Expenditure per Head on Farm Products (I.U.s)	Real Income per Head (I.U.s)	Price of Standard Ration (I.U.s)
Austria	327·6	310·6	48·4	205	107·6	44·3	227	130·3
Belgium-Luxembourg	487·8	554·5	56·6	344	104·2	61·8	518	121·0
Denmark	206·3	288·5	55·4	558	86·8	67·3	626	108·1
Finland	173·0	212·1	47·8	260	93·9	52·4	366	96·6
France	2327·0	2,418·9	56·4	353	112·9	57·4	376	102·9
Greece	259·0	265·6	37·7	193	..	34·9	150	..
Ireland	174·3	199·0	59·0	356	122·9	67·1	436	118·7
Italy	1380·4	1,536·8	32·3	164	106·0	32·9	230	154·7
Netherlands	473·0	568·9	55·1	428	118·3	55·2	503	141·7
Norway	268·8	337·1	92·8	361	..	102·7	480	..
Sweden	383·9	465·4	61·3	415	79·1	66·0	639	102·4
Switzerland	248·7	307·4	59·7	428	88·8	65·1	643	130·4
U.K.	2967·5	3,325·2	64·8	611	111·7	68·1	645	91·1
Canada	819·2	1,124·1	72·7	466	107·8	81·0	822	145·2
U.S.A.	9384·8	11,626·4	73·2	639	125·2	76·1	1093	136·0
Argentine	875·0	820·9	64·2	226	78·7	46·6	363	84·5
Brazil	1310·2	1,877·2	34·6	155	..	36·0	182	..
Chile	120·9	185·6	25·4	257	105·0	31·9	266	103·7
Colombia	230·5	415·9	27·5	85	..	36·9	118	..
Cuba	191·8	235·5	44·6	150	..	43·4	190	..
Japan	2362·5	2,019·1	33·7	220	..	24·1	202	..
Union of South Africa	226·2	386·7	23·5	197	100·3	31·0	284	104·5
Australia	520·4	538·9	76·4	485	88·5	64·9	765	98·1
New Zealand	129·5	151·7	82·3	710	93·9	79·7	958	105·3

However, before we proceed to analyse our results, we may begin by excluding the U.K., Argentine and Australia from the 1950–51 analysis, as some rationing still prevailed there (indicating that for some foodstuffs the price was

DIAGRAM VIII



below market equilibrium). It will also be noted that food consumption in South Africa is exceptionally low in relation to national income, probably a function of South Africa's unusual income distribution. These figures are also omitted from the analysis.

No explanation is available for the very low figures for Chile, but their accuracy is somewhat in question and they are also omitted from the analysis.

A double logarithmic diagram (Diagram IX) was prepared showing the price of food in relation to other prices each country, and the relative difference between the actual consumption and that calculated from the hyperbola. There is no doubt that the data will be in a downward

TABLE III — EQUATION FROM DIAGRAM VIII

Level of Income per Head per Annum (I.U.s)	Income Elasticity of Demand	Marginal Propensity to Spend on Farm Products	Proportion of Income Spent on Farm Products
X	$=\left(\frac{k}{x+k}\right)$	$=\frac{dy}{dx}$	$=\frac{A}{x+k}$
		$=\frac{Ak}{(x+k)^2}$	$=\frac{Y}{X}$
220	·654	·117	·179
320	·565	·088	·155
420	·497	·068	·136
520	·444	·054	·122
620	·401	·044	·110
820	·336	·031	·092
1020	·289	·023	·079

$k=415$
$A=114$

direction. Two lines are drawn indicating what must surely be near the extreme upper and lower limits of the possible value of this slope, at 0·42 and 0·67. We shall probably conclude that the price elasticity of demand for farm products, in respect of price changes at farm level, is probably above 0·5 and nearer to 0·6.

It is desirable to check this demand analysis from a different source, namely family budgets. We have numerous estimates of income elasticity of demand and

[contd. on p. 452

DIAGRAM IX

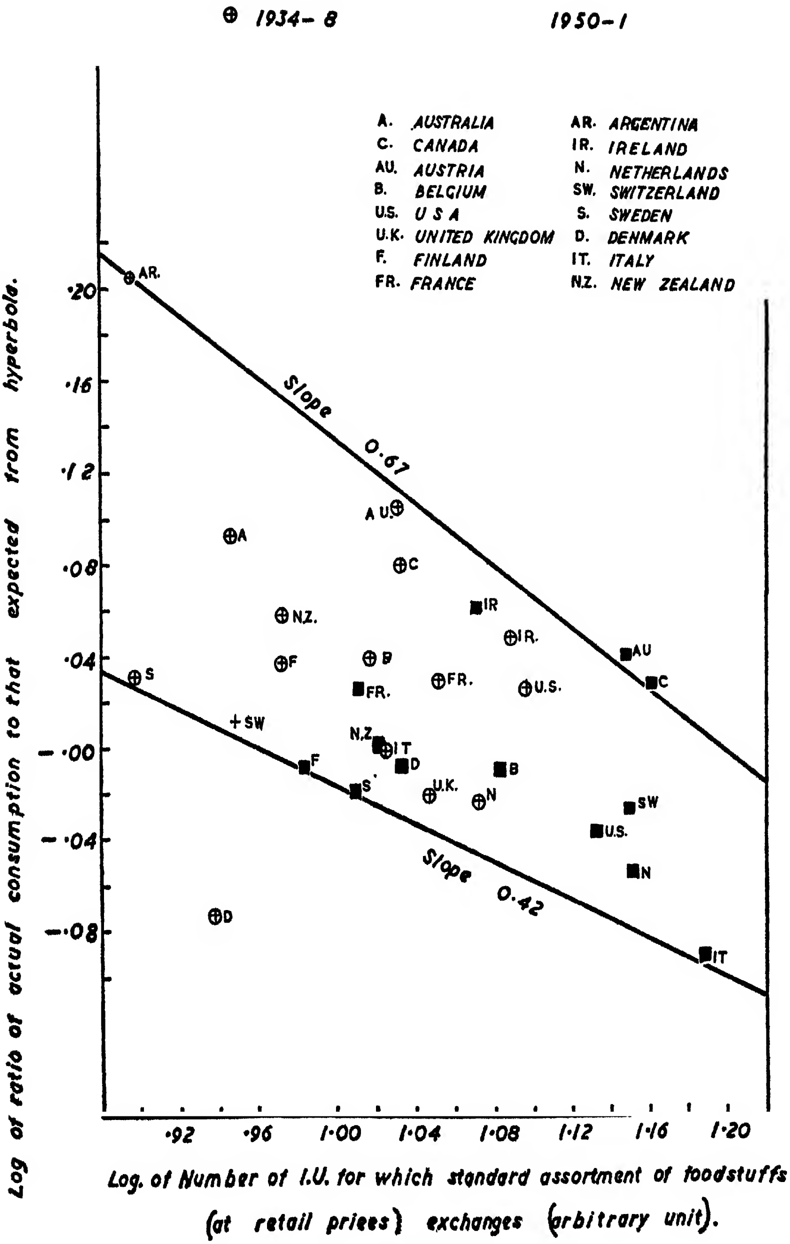
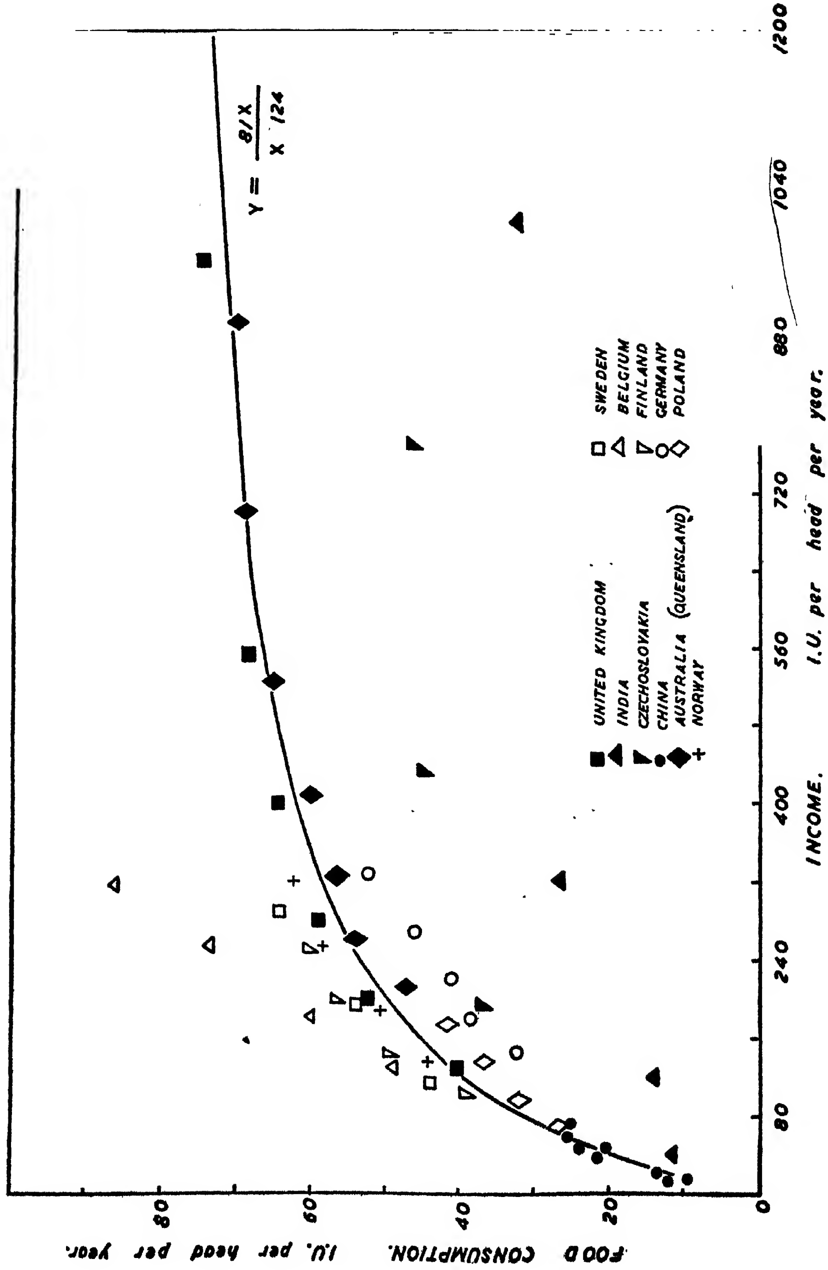

⊕ 1934-8
1950-1
A. AUSTRALIA
C. CANADA
AU. AUSTRIA
B. BELGIUM
U.S. U S A
U.K. UNITED KINGDOM
F. FINLAND
FR. FRANCE
AR. ARGENTINA
IR. IRELAND
N. NETHERLANDS
SW. SWITZERLAND
S. SWEDEN
D. DENMARK
IT. ITALY
N.Z. NEW ZEALAND
Slope 0·67
Slope 0·42
·20
·16
·12
·08
·04
-·00
-·04
-·08
·92
·96
1·00
1·04
1·08
1·12
1·16
1·20
Log of ratio of actual consumption to that expected from hyperbola.
Log. of Number of I.U. for which standard assortment of foodstuffs (at retail prices) exchanges (arbitrary unit).

DIAGRAM X



UNITED KINGDOM
INDIA
CZECHOSLOVAKIA
CHINA
AUSTRALIA (QUEENSLAND)
NORWAY
SWEDEN
BELGIUM
FINLAND
GERMANY
POLAND
Y = 81 X / X 124
INCOME. I.U. per head per year.
FOOD CONSUMPTION. I.U. per head per year.
0
80
240
400
560
720
880
1040
1200
20
40
60
80

TABLE IV

Food Consumption at Various Income Levels

Country and Year	Income per Head per Annum		Food Consumption per Head per Annum (I.U.)
	National Currency	I.U.	
Germany, 1927–28 . . .	576 (Rm.)	144	32·8
	720	180	38·8
	880	219	41·6
	1080	269	46·8
	1320	329	52·5
Belgium, 1928–29 . . .	3280 (Fr.)	129	49·0
	4550	179	60·1
	6370	251	73·4
	8000	315	86·1
Finland, 1928 . . .	3600 (Fm.)	102	39·5
	5000	142	49·8
	7000	198	56·6
	8800	249	60·4
Norway, 1927–28 . . .	648 (Kr.)	137	44·3
	880	187	50·7
	1000	254	58·6
	1520	320	62·3
Poland, 1929	432 (Zl.)	70	26·4
	600	97	32·0
	840	136	36·8
	1056	171	41·6
United Kingdom, 1935 . .	20·8 (£)	128	40·6
	32·5	200	52·5
	45·5	280	59·0
	65·0	399	64·4
	91·0	554	68·5
	156·0	960	74·4
Sweden, 1933	504 (Kr.)	113	44·0
	860	194	54·1
	1280	287	64·2

[*Table contd. overleaf*

TABLE IV (*contd.*)

FOOD CONSUMPTION AT VARIOUS INCOME LEVELS

Country and Year	Income per Head per Annum: National Currency	Income per Head per Annum: I.U.	Food Consumption per Head per Annum (I.U.)
China			
Winter wheat millet area		16	10·1
Spring wheat area		17	12·6
Winter wheat — Kaoliang area		24	13·9
Yangtze rice-wheat area		40	22·0
Szechwan rice area		46	21·1
Rice-tea area		48	24·2
South-West rice area		61	25·8
Double crop rice area		70	26·0
Queensland, Australia, 1939–40	47 (£)	211	47·3
	58	260	54·1
	72	323	56·7
	91	408	60·1
	117	524	65·4
	156	699	69·0
	200	896	70·0
Czechoslovakia, 1929–30	3,200 (Kc.)	192	37·0
	7,200	432	45·0
	12,800	768	46·8
India	..	40	11·8
	..	120	14·2
	..	320	26·9
	..	1000	32·7

Sources of data on which the above is based: India—Aykroyd, Indian Research Fund Association, *Note on the Results of Diet Surveys*. Queensland—" Family Expenditure Enquiry of 1939–40 ", *Queensland Year Book*, 1945. China—J. L. Buck, *China's Farm Economy* and *Land Utilization in China*. Other Countries—" Family Budgets "; *I.L.O. Year Book*, 1935–36.

contd. from p. 448]

general consumption functions obtained from this source. But almost always the data are in monetary terms, not in physical quantities. Quite apart from the different relative

prices which may prevail in different countries, these monetary expenditures include the costs of transport and distribution, and we cannot assume that such costs are relatively constant as between countries, or even between different income groups in the same country. In any large industrial city there are cheap shopping districts,

TABLE V—EQUATION FROM DIAGRAM IX

Level of Income per Head per Annum (I.U.s)	Income Elasticity of Demand	Marginal Propensity to Spend on Food	Proportion of Income Spent on Food
X	$=\left(\frac{k}{x+k}\right)$	$=\frac{dy}{dx}$	$=\left(\frac{A}{x+k}\right)$
		$=\frac{Ak}{(x+k)^2}$	$=\frac{Y}{X}$
20	·861	·48	·561
120	·509	·17	·331
220	·361	·08	·235
320	·280	·05	·182
420	·228	·03	·149
520	·193	·02	·126
620	·166	·02	·109
820	·132	·01	·086
1020	·109	·008	·071

$A = 80{\cdot}9$
$k = 124{\cdot}2$

and the families who buy their food there are taking a simpler but cheaper distributive service than those who buy elsewhere.

Diagram X[1] shows the relationship between food consumption and income as disclosed by family budget studies in various countries. The data[2] from which the

[1] The lower general level of this hyperbola, as compared with Diagram VIII, is in part explained by the fact that it refers to food only, and does not cover tobacco, textile fibres, etc.

[2] The details of consumption of individual foods, from the same sources, are given in the main tables at the beginning of the chapter.

diagram is constructed are set out in Table III. The *I.L.O. Year Book*, 1935–36 gives details of the physical quantity of consumption of foodstuffs and beverages at various income levels. Data for China, Australia and India were obtained from other sources as shown in the table. Income in national currency units and food consumption in kilograms were expressed in real terms by converting to International Units (I.U.s). Food consumption per head is the result of aggregating the individual items of food consumption after their conversion to I.U.s. It should be noted that this method gives to each type of food its "real" value in the economic sense—i.e. foods of a higher quality have a higher I.U. value. It is for this reason that the Latin European countries with their somewhat expensive tastes, e.g. France and Belgium, fall well above the line. The rigours of the Indian diet may be seen from its position well below the line, even for the higher income groups. The Indian diet, in common with that of most Asian countries, is greatly deficient in animal proteins, which are more expensive than those derived from vegetable foods. But consideration of the low food consumption shown even for high real incomes in India raises three points: (i) the force of religion and social custom, in discouraging the consumption of meat; (ii) whether food requirements may be significantly lower at high temperatures; (iii) if food requirements are to be estimated, as biologists tell us, per kilogram of body-weight, then the low average weight of the Indian population is also a factor which must be taken into account.

The relationship deduced from family budgets between food consumption per head per annum and real income per head per annum may be represented approximately by the hyperbola

$$Y = \frac{81x}{x+124}.$$

The points representing the Indian and Belgian data are disposed at the same distance from this curve, and some possible explanations for this have already been indicated.

The asymptote, and the income elasticity of demand, as shown by family budgets, are both considerably lower than those shown by national aggregates. These latter, of course, include textiles and other non-edible farm products, but not sufficient to explain the whole difference; there is probably a general tendency to understatement in family budget studies.

An exhaustive study of the relation of food consumption to real income per head in pre-war and post-war Germany is made by Dr. H. J. Metzdorf in "Die Stabilität der Verbraucherausgaben für Nährungsmittel" (*Wirtschaftsdienst*, July 1950). The analysis covers all necessary foodstuffs, but excludes liquor, tobacco and luxury foods. The household budgets examined were those of workers, clerks and higher Civil servants. The calculations were made for the four widely different years 1907, 1927–28, 1937 and 1949, income data being recalculated in terms of 1927–28 purchasing power, and have now been converted to I.U.s for the construction of the diagram.

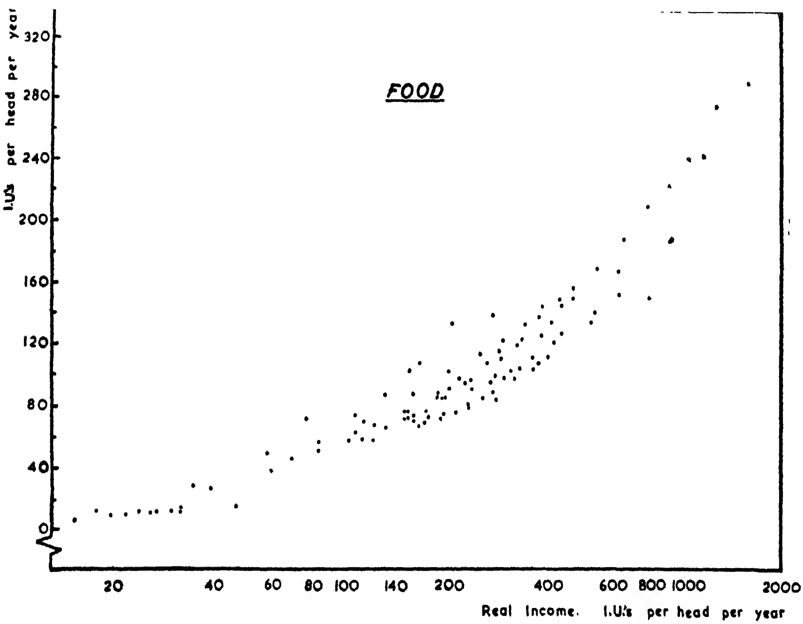
The analysis shows that the proportion of real income spent on food, at a given real income level, has remained remarkably constant through all the vicissitudes of the 40-year period under review; and, more interesting still, that the relationship does not differ between social classes.

No worker in this field can lightly disagree with the thorough and careful analysis made by Mr. J. L. Nicholson in *Journal of the Royal Statistical Society* (1949, p. 370). Mr. Nicholson obtains income elasticity of demand far higher than those shown by the second hyperbola (International Comparison of Quantities in Family Budgets). From the first hyperbola (comparisons of national aggregates) his results are not so far removed. He finds that the poorer households still have somewhat higher income elasticities of demand than are indicated by this latter curve, the wealthier households (with over £5 a week pre-war) slightly less. His data referred to 1937 and may be a reflection of English eating habits, particularly the tendency to demand meat wherever possible, as compared with

other countries. It may be that these tastes have now changed somewhat.

Those who wish to make further comparisons with Mr. Nicholson's tables should use the coefficient that 1d. per week of family income per head in 1937 can be equated to 1·21 I.U. per head per year.

DIAGRAM XI



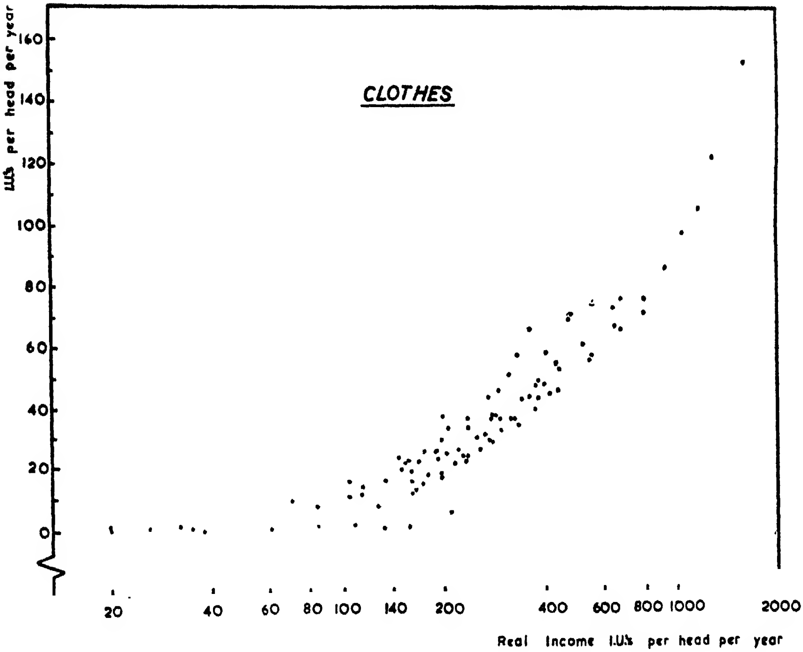
In respect of changes in real income caused by changing size of family, where aggregate income is given, income elasticity of demand for food appears to change in about the manner to be expected from the hyperbola.

When we apply the same method of analysis to non-food consumption we obtain rather different results. Generally speaking, we find that the diagrams do not show saturation of demand, within the range of incomes which we are able to study.

Our first and best source of material is from family

budget studies. The number of such studies in which expenditure on different objects is classified according to income per head (or per consumption unit) is, however, limited. The form in which results are published also does not always allow us to compare *expenditure* on different

DIAGRAM XII



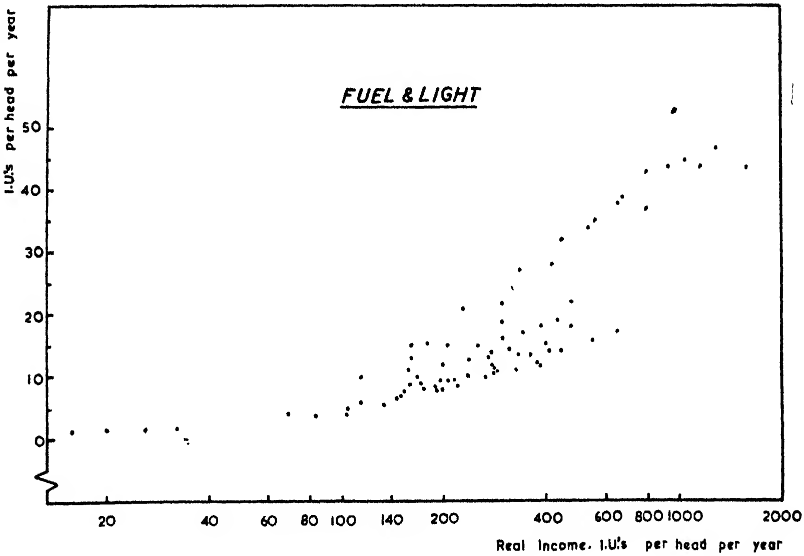
objects with *income* per head. Sometimes we only know total expenditure, and then it is necessary to relate expenditure to income by arbitrary assumptions about the proportion of income saved (which, however, is not very high, except in the case of the highest incomes).

The field was officially surveyed by the International Labour Office in its Year Books, the most recent publication with this particular classification being in the Year Book of 1951–52. These are supplemented by some other information in the surveys of 1918 and 1901 in the U.S.,

two surveys in Japan and a little fragmentary information about the expenditure of very low incomes.

Money incomes in various countries are converted to real incomes by coefficients representing the general purchasing power of the currency. These same general coefficients are then applied to the components of expenditure. It would be more accurate to use different coefficients for clothing, rent, etc., but in view of the orders of precision to which we are at present working the extra labour does not appear to be justified.

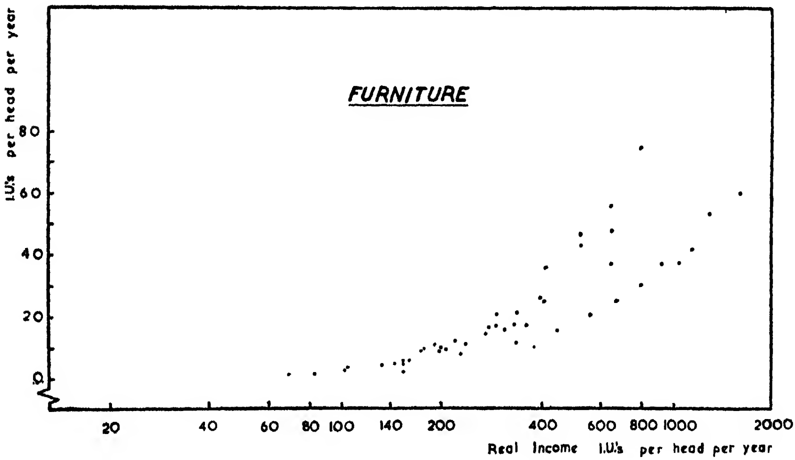
DIAGRAM XIII



There are clear signs of the expenditure on food and fuel ceasing to increase as the saturation demand is approached. In comparing the curvature of this diagram with that of the diagrams of various articles of food and fuel previously examined, it must be remembered, of course, that food and fuel consumption at the highest income levels includes a decreasing proportion of the types of food and fuel the demand for which may become

saturated, and an increasing proportion of the foods and fuel with more expansible demand. It must also be remembered that the figures here quoted include the transport and distribution of food which in wealthy countries may cost as much as its production, and a proportion, moreover, which increases in respect of the food consumed at the highest income levels, which is often

DIAGRAM XIV



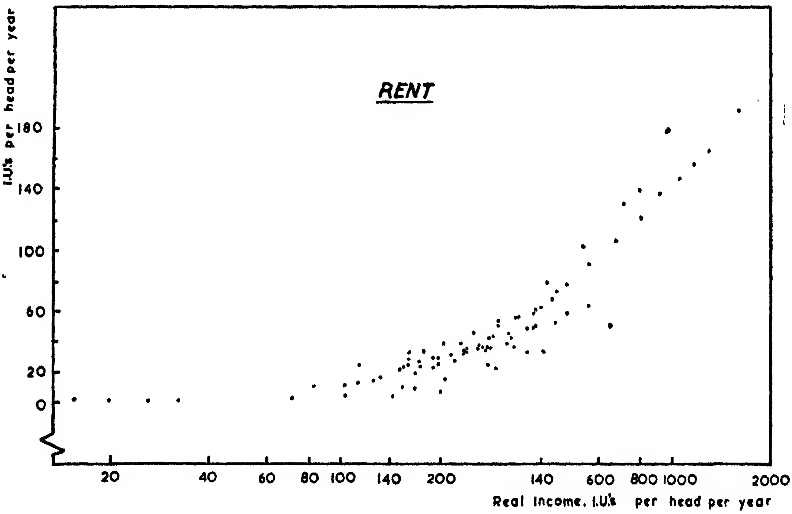
purchased at the most expensive shops, which give the most service.

On the curve for rent there are some signs that saturation is being approached. At any rate, at the highest income levels, the curve appears to be ascending without acceleration, which means, of course, on a logarithmic scale, that the proportion of income spent on rent is decreasing. All the same, the saturation demand for housing probably only occurs at a much higher income level than any which we have so far studied.

In the case of clothing the curve shows an accelerated upward trend, and the saturation level may be almost indefinitely high. In the case of furniture it also appears that we are only at the beginning of the growth. The

limited number of high income data (over 400 I.U. per head per year) available to us fork out widely into three distinct branches, warning us that (especially in the case of a durable goods purchase such as this) other factors besides real income level may be at work. Of the three prongs of the fork, the points in the middle are the data from Norway for 1947–48, the lower data for U.S. in 1934–1936 and the upper data for Canada in 1937–38. In the U.S. in 1934–36 depression and unemployment were

DIAGRAM XV



widespread and most families had probably built up a good stock of furniture during the preceding boom years. The years 1937–38 in Canada, on the other hand, were a sudden period of recovery, after a very long depression period in which furniture stocks had probably deteriorated considerably.

Fuel, on the other hand, shows a clear saturation demand after an income of about 800 I.U. per head per year has been reached. The data on the diagram indicating saturation are from the United States and Canada. There are

[contd. on p. 463

TABLE VI

Incomes and Consumption in I.U. per Head

Monthly Labour Review, October 1938

Japan—1936–37 : Income	113	160	172	197	216	234	281
Food and drink	59·0	70·1	69·5	72·4	75·5	77·9	83·5
Rent	14·2	26·1	27·1	29·6	31·1	33·7	36·8
Fuel	5·8	8·9	8·9	9·5	9·6	9·9	10·5
Clothing	11·8	11·9	15·1	18·3	21·3	23·8	28·9

Gourou, 9th Conference, Institute of Pacific Relations

Indo-China (Tonkin) *—1938	76	139	233	475
Food	71	117	195	..
Clothing	2·6	4·1	..	..
(Amount of peasant's landholding, in hectares)	0	0·1	1·5	5·0

U.S. Official (2-child families)

1901 : Income	114	160	205	251	297	343	388	434	479
Rent	25	33	39	45	50	56	60	67	77
Fuel and light	10	13	15	15	16	17	18	19	22
Clothing	14	19	25	30	36	42	48	54	68
Food	70	87	102	114	122	133	144	149	156

1918–19 : Income	157	199	238	271	313	331	362
Food	72	84	91	95	102	104	111
Clothing	22	29	36	43	50	56	65
Rent	24	28	32	34	38	36	34
Fuel and light	11·0	11·9	12·9	13·2	14·2	13·5	13·2
Furniture	5·8	8·8	10·9	14·0	15·8	17·0	17·2

International Statistical Institute, Tokyo Session, 1930

Japan—1926 : Income	126	164	199	233	258	276	320	364	378
Rent	15	20	26	32	36	36	45	48	48
Clothing	8	13	18	22	26	29	36	43	39
Drink	3·8	4·5	5·7	6·1	7·3	8·5	8·8	9·5	10·5
Tobacco	2·3	2·7	3·1	2·9	3·0	3·5	4·0	3·6	4·6
Food	57	67	75	80	85	88	97	103	107

L.O. Year Book, 1935–36 and 1951–52

Canada—1937–38 : Income	179	298	418	538	658	800
Food	73	98	121	135	152	150
Rent	35	54	78	101	130	139
Furniture	95	22	36	47	56	75
Fuel and light	15·4	21·6	28	34	38	37
Clothing	18	32	44	60	66	70

* Data in O.U. per head, not I.U. per head.

TABLE VI (*contd.*)

Incomes and Consumption in I.U. per Head

I.L.O. Year Book, 1935–36 and 1951–52

U.S.—1934–36: Income	160	229	338	480	560	680	800	925	1050	1170	1290	1600
Food . .	73	95	122	146	168	186	207	223	240	242	275	290
Rent . .	28	38	56	72	90	105	120	137	146	156	164	192
Furniture .	5·7	7·4	11·1	15·5	20	25	30	36	37	42	53	60
Fuel and light .	15	21	27	32	35	39	43	44	45	44	47	44
Clothing . .	16	24	34	45	55	65	75	85	96	104	121	152

Colombia—1936: Income .	38	60	83	107	131	158	210
Food	26	38	57	74	87	102	134
Rent, fuel, light . .	10·6	15·6	21	25	32	43	56
Clothing . . .	0	0·5	1·4	1·7	0·8	1·3	6·0

Finland—1928: Income	83	103	133	192	221	265	325	385	443	550
Food . . .	50	57	66	88	97	107	119	126	128	140
Rent . . .	11	12	17	23	28	36	42	50	53	63
Furniture . .	1·4	2·9	4·3	10·7	12	..	..	..	..	..
Fuel and light .	3·7	4·0	5·3	8·0	8·4	10	11	12	14	16
Clothing . .	9	11	16	23	26	31	36	43	52	56

Czechoslovakia—1929: Income .	168	277	480
Food	108	138	150
Rent	10	24	58
Fuel and light . . .	10	14	18
Clothing	22	36	69

Germany—1928: Income .	150	191	238	288	380
Food	71	87	97	114	138
Rent	22	29	34	43	58
Fuel and light . .	7	8	10	11	12
Clothing . . .	20	26	33	37	47

Norway—1947–48: Income .	154	207	292	410	650
Food	76	91	110	134	167
Rent	11	16	21	34	51
Furniture	4·3	9·1	17	25	37
Fuel and light . . .	8	9·5	11·5	14	17
Clothing	22	33	45	57	72

Poland—1929: Income .	69	104	145	200
Food	45	63	76	85
Rent	2·7	4·6	5·3	6·5
Furniture . . .	1·3	3·0	4·9	9·6
Fuel and light . .	4·1	4·9	6·4	7·9
Clothing . . .	10	16	24	37

TABLE VI (*contd.*)

Incomes and Consumption in I.U. per Head

I.L.O. Year Book, 1935–36 and 1951–52

Sweden—1933: Income	175	280	400
Food	77	99	112
Rent	24	42	62
Furniture	9	16	26
Fuel and light	8	12	15
Clothing	26	37	47

Dittmer, *Quarterly Journal of Economics*, 1918–19

China *—1912–18: Income	24	28	31	38
Food	19·3	19·9	21·5	26·5
Clothing	1·5	2·5	2·7	3·6
Fuel and light	1·5	2·1	2·2	2·1
Housing	2·0	2·1	2·2	2·5

Royal Commission on Labour in India

Madras—1928: Income	22	24	26	30	32	47
Food	9·6	11·8	10·9	12·2	11·9	15·8

Cawnpore †—1928: Income	16	20	26	32
Food	8·2	9·5	11·8	14·6
Clothing	1·4	1·5	1·8	2·2
Fuel and light	1·2	1·3	1·4	1·6
Rent	1·5	1·9	2·2	2·2

* Purchasing power of the Chinese dollar (then equal to half the U.S. dollar) assumed to be 1 I.U. The weighted average income here shown is thus 28·5 I.U. per head. An O.U. calculation for North China would indicate 165 O.U. per head.

† Average size of family, at given income level, assumed same as Madras.

contd. from p. 460]

signs here, too, of a "lower branch" of the curve: in this we find particularly data from Norway and Finland. In spite of their severe winters, fuel is cheap in these countries — and houses well insulated.

For the income ranges in which it seems fairly clear that we are not approaching saturation demand, it is permissible to use simpler methods of analysis in which we can express income elasticity of demand as a single coefficient. This method of analysis (a great improvement on all previous work) was that indicated by Sir Arthur Bowley and Professor Allen in their book, *Family Expenditure*, published in 1935. Their method was intended also

to cover food, for which a more refined analysis now seems to be necessary, in view of the approach of saturation demand, but can be applied to other commodities.

They showed that, if expenditure on any particular commodity or group of commodities were plotted against income as a whole, the results lay along a straight line within the range of incomes studied. The order in which these curves cut a vertical line representing zero income measures what Professors Bowley and Allen describe as the "order of urgency". At the point of zero income certain values remain positive and others have become negative. Food, rent and fuel (in that order) represent the most urgent needs; furniture, clothing and miscellaneous expenditure represent the less urgent or more postponable forms of expenditure.

The measurement of these urgencies is by no means the sole reason for constructing such a diagram. Next we proceed to measure the slopes of the various lines, indicative of the rate at which expenditure on any particular object increases with increasing income. This factor is called by Professors Allen and Bowley k, and it is clear that it is an additive characteristic. That is to say, the value of k for food as a whole is equal to the sum of the values of k for each different type of foodstuff.

If any particular family spends a fraction w of its income on one object, and the community as a whole spends a fraction $\bar{w}$, then the average income elasticity of demand for this commodity is given by

$$\bar{\eta} = \frac{k}{\bar{w}}.$$

Income elasticity is the ratio between the increment of consumption of this commodity and an increment of income, other factors remaining constant. It may vary at different income levels, but the above formula gives the average for the community as a whole. By the use of this formula Professors Allen and Bowley are able to make some interesting calculations of income elasticities of demand.

Some of their results are given in the following tables:

TABLE VII

Income Elasticities of Demand

	Average Income per Head in I.U. (assuming 4 persons per family)	Housing (including rates and taxes on houses)	Clothing	Furniture, Household Linen and Utensils
Belgium, 1928–29 (manual workers)	212	0·5	1·1	0·7
Czechoslovakia, 1927–29 (manual workers)	171	0·8	1·5	1·0
(officials)	259	0·8	1·2	0·9
Denmark, 1922 (all classes)	440	1·0	1·0	1·3
Finland, 1920–21 (manual workers)	117	1·1	1·4	1·8
Germany, 1927–28 (manual workers)	198	0·6	1·4	1·8
(salaried employees)	272	0·7	1·2	1·8
(officials)	308	1·0	1·1	1·4
Great Britain, 1929 (manual workers, Liverpool)	173	0·8	1·4	..
1932 (all classes)	641	0·7	1·0	..
Netherlands, 1923–24 (all classes)	376	1·0	1·5	..
Norway, 1912–13 (all classes)	193	0·9	1·9	1·25
1918–19 (all classes)	243	1·0	1·3	0·5
Poland, 1929 (manual workers)	139	0·6	1·6	2·2
Switzerland, 1912 (all classes)	215	0·7	1·1	1·5
1921 (all classes)	215	0·9	1·4	1·0
U.S.A., 1918 (all classes)	298	0·7	1·4	1·2
1928–29 (farmers)	305	..	1·1	..

TABLE VIII

Income Elasticities of Demand

	Belgium, 1928–29	Germany, 1927–28	Sweden, 1923	Finland, 1920–21
Rye bread	..	−0·6	} 1·2	1·0
Wheat bread	..	1·1		
Flour	..	..	−0·3	−0·5
Milk	0·6	1·3	0·95	1·1
Butter	1·8	2·35	1·5	1·0
Margarine	−1·4	−0·65	−0·3	−1·3
Eggs	1·35	1·6	1·5	..
Potatoes	0·2	..	0·2	0·4
Other vegetables	1·2	1·45	..	..
Fresh fruit	2·3	..	..	..
Sugar	0·6	0·5	0·8	0·8
Coffee	1·0	1·9	0·9	1·2

Some more elaborate calculations were made by Professor Wold for Sweden, computing for three different years independently in order to test for time trends, or chance events of a particular period :

TABLE IX

INCOME ELASTICITIES OF DEMAND

	1913	1923	1933
Rent	0·76	1·12	1·28
Furniture	1·85	1·58	1·41
Clothing	1·17	1·13	0·96
Health services	1·31	1·38	1·09
Entertainment, education, books	1·70	1·89	1·88
Domestic help	5·20	3·00	1·73

He found no great difference between the figures for manual and for non-manual workers. In the larger families, income elasticity of demand was a little higher for rent, fuel and furniture, a little lower for health services.

TABLE X

INCOME ELASTICITIES OF DEMAND

	Comparing Incomes \$2750–4500	Comparing Incomes \$4500–7500
Paid household service	2·13	1·36
Recreation	1·07	0·93
Automobile purchase	1·04	0·80
Clothing	0·98	0·70
Transportation	0·94	0·70
Household operation	0·90	0·85
Shelter	0·77	0·77

The apparent absence, at any range of incomes so far studied, of any approach of saturation in the demand for clothing is also clearly shown in the data for 1929 in *America's Capacity to Consume*, where the income elasticity of demand for clothing remains at 0·85 for all incomes, even those above \$8000 (i.e. well above 2000 I.U. per head),

while the other expenditures (food and a composite item designated " home ") show marked change of elasticity at the higher incomes.

From *Family Expenditure in the U.S., 1935–36* income elasticities can be calculated as above (Table X).

The fitting of non-linear equations to income-consumption relationships was undertaken by Professor (now Senator) Douglas and Mr. Gregg Lewis,[1] Signor Alessandro Costanzo [2] (using German 1927–28 data) and by Mr. J. L. Nicholson.[3] Mr. Nicholson made a painstaking and pioneering research into all the original documents of the British Family Budget study of 1937–38, and showed how important it was to distinguish families of different sizes. If families of different sizes are lumped together, elasticities calculated from a crude income-per-head classification are liable, he found, to serious bias.

Having separated out the family sizes, he then proceeds to fit parabolic relationships. This form of curve, however, will probably only serve for short-range interpolation. It shows elasticities rapidly falling with rising income — indeed too rapidly. Thus for a family with two children, as real income per head rises from 180 to 360 I.U., Mr. Nicholson's figures for income elasticity of demand for clothing fall from 2·46 to 0·76, for housing from 0·98 to 0 (i.e. an apparent saturation demand, which is obviously not the case).

An ingenious alternative method of computing income elasticity of demand for domestic service was undertaken by Professor Stigler (National Bureau of Economic Research, *Occasional Paper 24*), who analysed demand for domestic servants by States in relation to average income in the State, and wages paid to domestics. Partial correlation indicates an income elasticity of demand of 2·0.

He also finds data indicating that elasticity of supply in relation to wages may be about 3.

Some further light is thrown on expenditure in England

1 *Studies in Consumer Expenditure*, University of Chicago Press, 1947.
2 Income and Wealth Conference, Castel Gandolfo, 1953.
3 *Journal of the Royal Statistical Society*, Part IV, 1949.

in the higher income ranges by a collection of budgets collected by the Bank Officers' Guild, and by a private collection of budgets, covering incomes up to about £3000 a year,[1] made by Mr. Nigel Balchin in his witty work, *Income and Outcome*. The former are mostly in the rang £250 to £700 and cover much the same field as the 192 Clerks' Budgets quoted by Professors Allen and Bowley (average income £482), though the Bank Officers' figures make possible a more detailed analysis of expenditure.

The results may be summarised as follows:

TABLE XI

	k		$\bar{w}$	$\bar{\eta}$
	Bank Officers' Guild	*Income and Outcome*		
Rent	·077	·088	·092	0·8–0·9
Clothing	·093	·061	·096	0·6–1·0
Motor car	·099	·122	·024	4–5
Domestic service	·17	·127	·038	3·5–4·5
Travel	·10	..	·041	2·5
Tobacco	·008	..	·035	0·2
Medical attention	·025	..	·018	1·4
Furniture	·040	..	·024	1·7
Amusement	..	·056	·025	2·2

The following income elasticities were calculated for Australia from the Queensland family budgets of 1939–40:

Dwelling	0·97
Health and education	0·92
Clothing	0·97
Household equipment and cars:	
New	1·49
Repairs	1·33
Recreation	1·30

The demand for housing shows remarkable regional variations. A study for 1947 of income groups in the U.S.[2] rising to family incomes of over $10,000 shows the contrasting experiences of Washington, Richmond (Vir-

[1] Pre-1939. [2] *Monthly Labour Review*, October 1949.

ginia) and Manchester, New Hampshire (a small industrial town). In Richmond the proportion of people owning their own homes rose rapidly with rising income and reached 100 per cent for the highest income groups; but in Washington and Manchester the proportion owning their own homes does not rise much above 50 per cent, even at the highest income levels. At any given income level, families renting houses in Richmond spent some 30 per cent less on rent than did families in Washington; families in Manchester, except when at the lowest income level, spent less than half.

TABLE XII

CANADIAN EXPENDITURE

Income $ per Head	English-speaking Families				French-speaking Families			
	Children per Family	Rooms per Person	Percentage of Families		Children per Family	Rooms per Person	Percentage of Families	
			Owning House	Owning Car			Owning House	Owning Car
400– 799	2·4	1·0	9	4	2·1	0·9	4	7
800–1199	2·25	1·1	25	18	2·8	0·9	0	0
1200–1599	2·2	1·15	30	35	2·9	0·9	9	12
1600–1999	2·3	1·25	43	42	4·4	0·8	12	23
Over 2000	2·4	1·3	42	59	4·9	0·9	10	15

The Canadian 1937–38 study, *Family Income and Expenditure*, shows a considerably higher proportion of income spent on "shelter" than in most countries (this expenditure does not include fuel). Those renting their dwellings, except at the highest income levels, spent on the average 20 per cent of their income on them. Those owning their dwellings spent, including interest actual or imputed, 15 per cent of their incomes at the lowest level, rising to 22 per cent at the highest.

The peculiar circumstances of Canada, with two very different communities living side by side, give us an opportunity of demonstrating how the structure of demand can be affected by another factor, namely the decision to spend the family resources on bringing up more children, rather than upon buying or improving a house, a car or

other object of expenditure. The Canadian figures show that, in any given income group except the lowest, French-speaking families will bring up more children, have less house-room per head and be less likely to purchase a house or a car.

There are a few other data on consumption at very low income levels which are of some interest, but which cannot be included with the main tables through lack of knowledge of the real income of the families concerned, or of their average size.

TABLE XIII

PERCENTAGE DISTRIBUTION OF EXPENDITURE AT LOW INCOME LEVELS — OTHER DATA

	Indian Rural Wage Workers *		Manchester Manual Workers‡	U.K. Average Family‖	English Manual Workers¶	
					Agricultural	Non-agricultural
	1939	1945	1836–41	1859	1794	1794
Cereals	77·5	70·7	58·5	61·7	46·1	36·2
Other food					28·3	37·8
Housing	0·8	1·7	11·1	13·3	4·6	6·0
Clothing	11·7	11·9	§	10·0	9·0	5·0
Fuel and light	7·3	7·8	4·8	5·0	4·4	5·4
Soap			2·1	1·7	7·6	9·6
Other expenditure			23·3	8·3		
"Ceremonies"	2·8	7·8	..	..	..	..
Income per year	182 Rs.†	360 Rs.	£28·8	£78	..	..

* *Agricultural Situation in India*, November 1950.
† Of which 9 rupees on the average was saved.
‡ Neild (Mayor of Manchester), *Journal of the Royal Statistical Society*, 1841–42.
§ Included in "Other".
‖ Chadwick, *Journal of the Royal Statistical Society*, 1860.
¶ Professor Stigler, National Bureau of Economic Research (U.S.), 30th Annual Report.

The general impression is that an expenditure of 75 per cent of income on food represents practically the lowest level of subsistence. A figure as high as 71 per cent is shown for Brazil[1] in 1936–37, for families with incomes of less than 650 I.U. per year. Unless they were very large families this proportion is unexpectedly high.

Leroy-Beaulieu confirms the high figures shown for

[1] R. M. Woodbury, *Food Consumption and Dietary Services in the Americas.*

agricultural labourers in eighteenth-century England by quoting an estimate (by Villeneuve-Bargemont) that a French manual working family with an income of 600 francs (about 200 I.U.) in 1839 would spend half of their income on bread. By 1878, when the price of bread had fallen 15–20 per cent (and other prices had also fallen), a family with the same income would be spending 25 per cent of their income on bread.

We now leave the determination of income elasticities of demand from budget studies and consider their determination from time series. In almost every case this involves our considering income elasticity and price elasticity as two unknown variables which have to be determined simultaneously; and sometimes it may be necessary to eliminate the effect of other disturbing variables also.

In a *magnum opus* setting the whole study of consumption on a new footing (*Journal of the Royal Statistical Society*, 1945), Professor Richard Stone has made use of a profound multivariate analysis to make simultaneous determinations of price elasticity and of income elasticity. The income elasticity measured is that of the community as a whole, i.e. shows the effect on the consumption of the commodity in question of changes in the aggregate real national income, rather than measuring differences in consumption between income groups (see table, page 472).

Mr. Cochrane (*Journal of Farm Economics*, May 1947), comparing food and non-food prices, found a price elasticity of demand for food of $-0{\cdot}41$ in U.S.A. over the period 1922–39.

A novel method was applied by W. E. Black (Cornell University Agricultural Experiment Station, *Bulletin No. 800*, 1943). From a large number of families, classified in four income groups, he ascertained the quantity of apples consumed per head annually in years of different retail prices. Comparison of the income groups shows only a small income elasticity: within each income group a price elasticity of about $-0{\cdot}6$ appears to prevail.

The U.S. Department of Agriculture (*The Agricultural Situation*, April 1940) estimated the price elasticity of demand for potatoes, after eliminating the effect of changes in national income, at −0·27 or −0·34, when aggregate output was below and above 250 million bushels respectively. That demand becomes slightly more elastic at lower prices is unexpected.

TABLE XIV

PROFESSOR STONE'S ELASTICITIES

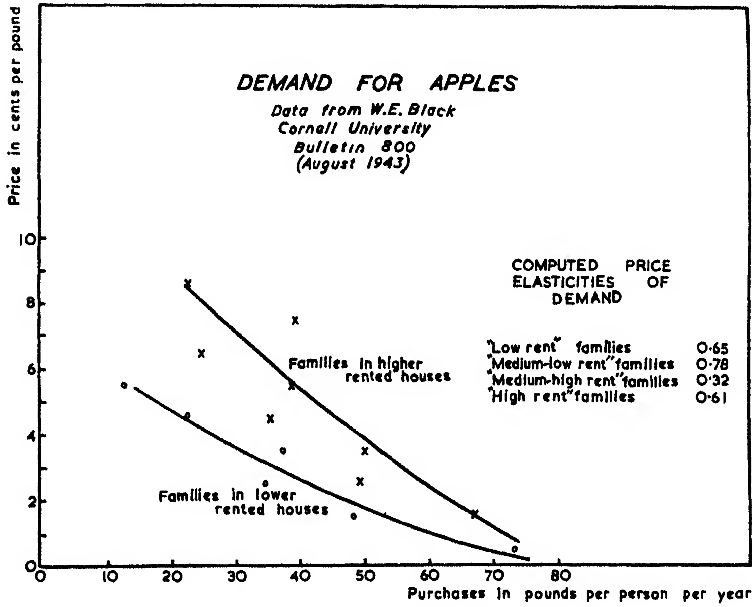
Commodity	Price Elasticity	Income Elasticity	Other Variables Eliminated
Great Britain:			
Beer	−0·73	0·14	General price-level, gravity of beer
Spirits	−0·72	0·54	General price-level, time trend
Tobacco	−0·51	0·07	Time trend, extent of coupon trading
Drink and tobacco as a whole	−0·92	0·17	General price-level, time trend
Soap	−0·38	0·32	General price-level, time trend
U.S.A.:			
Food	−0·54	0·59	General price-level
Tobacco	−0·24	0·32	General price-level, time trend
Durable household equipment	−2·12	2·07	General price-level, time trend
Automobiles	−2·70	4·16	Time trend

Mr. K. S. Lomax, analysing time series of British demand for potatoes,[1] uses the interesting device of treating relative price as the determinate, consumption and relative income as the determinants. He finds that price varies inversely with consumption raised to the power of $1\frac{1}{2}$ and with the square root of relative income. At a given income level this indicates a price elasticity as

[1] *The Manchester School*, May 1950.

high as 0·7; so far as income elasticity is concerned potatoes are an "inferior good", demand for which declines as real income rises.

DIAGRAM XVI



Mr. Borch[1] considered the possibility of a non-linear fitting for income elasticity. He secured a good fit on the assumption that income elasticity might vary with income y, following a relationship $p+q/\log y$, where p and q are constants. Using Professor Stone's data he found that income elasticity of demand for beer became negative at an income of about £1000 and for spirits at a higher level; but that the income elasticity of demand for tobacco went on increasing, even at indefinitely high incomes. This is proving a bit too much.

Perhaps the most interesting statement dates back to the seventeenth century in the form of "Gregory King's Law" (as quoted by Yule, *Journal of the Royal Statistical*

[1] *Econometrica*, April 1953.

Society, 1915, p. 296), to the effect "That a Defect in the Harvest may raise the Price of Corn in the following proportions:

Defect		Above the Common Rate
$\frac{1}{10}$	Raises the price	$\frac{3}{10}$
$\frac{2}{10}$	Do.	$\frac{8}{10}$
$\frac{3}{10}$	Do.	$\frac{16}{10}$
$\frac{4}{10}$	Do.	$\frac{28}{10}$
$\frac{5}{10}$	Do.	$\frac{45}{10}$"

This indicates an elasticity of demand of about −0·7 in times of great shortage, −0·35 in times of normal harvests.

The excellence of Gregory King's work in other fields entitles us to presume that this interesting result is based on a careful examination and summarising of a considerable quantity of information which is now no longer available. The elasticity in times of normal harvests appears to be about the same as it is now.

Professor Tinbergen (*Ekonomisk Tidskrift*, September 1947) found the price elasticity of demand for tramway service to be −0·25 in Stockholm and Marseilles but −0·75 in Dutch and Danish towns (perhaps because of greater competition from bicycles). Mr. Lomax (*The Manchester School*, January 1948) found the income elasticities of demand for cotton and rayon yarn in Britain to be 0·9 and 1·7 respectively, the price elasticities −0·2 and −1·0.

Milk, which has a fairly high income elasticity, apparently has a price elasticity of only −0·1 (Cassels, *Journal of Political Economy*, August 1935). For manufactured dairy products he found a composite elasticity of demand of −1·0.

Milk, however, is a commodity for which price elasticity of demand has been found to fall, first rapidly and then at a decelerating rate with rising real income.[1] For the poorest consumers studied, with an average income per head of only 93 I.U. per year, the price elasticity of demand was as high as 1·2. At a real income of 200 I.U. per head

[1] Frisch, *Staatsoekonomisk Tidskrift*, 1938.

price elasticity was a little over 0·5, falling gradually to 0·23 at an income of 420 I.U. per head, the wealthiest families studied. This is not altogether incompatible with the very low figure for the U.S. A similar variability in price elasticity of demand was shown by Professor Wold [1] for eggs. In this case price elasticity of demand is found to be high, not so much when income is low as when the price of eggs is high, and vice versa.

TABLE XV

	Price as Percentage of Annual Average	Price Elasticity of Demand
February-April .	88	1·16
May-July . .	75	0·78
August-October .	104	1·07
November-January .	123	1·50
Annual average .	100	1·07

Income elasticity of demand, at a given price-level, he places as high as 0·7. For milk he found a price elasticity of demand between 0·2 and 0·3 — compatible with the Norwegian figures.

Dr. Verdoorn in his book *Marktanalyse* set out to analyse the demand for sugar by comparing consumption in different countries, in which the price of sugar was fixed at very different levels, for the period 1934–38. Noticing certain systematic discrepancies in the residuals he introduced a third determinant besides income and price, namely temperatures. (Countries with a colder climate, all other things being equal, have the greater demand for sugar.) The data thus qualified show a good fit, with the price elasticity higher than is generally supposed at 0·41, and an income elasticity of 0·26.

A figure of 0·4 for price elasticity is also obtained in India [2] correlating national consumption with changes in

[1] Statens Offentliga Utredningar 1940, 16 — Jordbruksdepartmentet.
[2] Nayer and Pillai, *Sankhya*, December 1942.

the *wholesale* price (presumably this was chosen as more representative of the price prevailing in rural areas).

A refined study of the demand for coffee in the U.S.[1] shows that demand contains a positive time trend, and also a marked *negative* term (disposable real income/relative price of coffee). The general price elasticity of demand is somewhere about 0·25, falling as real income rises, but rising markedly if price rises — as with eggs and milk.

The price elasticity of demand for oranges from Israel[2] in Britain and the continent of Europe for a long time looked as though it were only in the neighbourhood of 0·2. But since 1951, in Britain but not in the rest of Europe, it appears that the nature of demand has suddenly changed. The level of demand at any given price is now lower, but the price elasticity is much higher, probably in excess of 2. (Possibly this reflects increasing competition from American oranges.)

It should be mentioned that Professor Pigou's extremely ingenious method of using family budget data to determine the *relative* price elasticities of demand for different commodities, devised so long ago as 1912 (Appendix to *Economics of Welfare*), has as yet received hardly any application. It may have very considerable possibilities.

Professor Pigou also gave a simple method of deducing price elasticities from time series.[3] This also has been little used. An application to British data for consumption of petrol between 1929–36, to which it appears well suited, gives a coefficient of 1·2. This probably, however, is a commodity for which the income elasticity of demand is falling, as real incomes and the number of cars increases. A calculation based on Australian time series over the period 1927–39, taking into account changes in the price of petrol, in incomes and in the number of vehicles, indicates a price elasticity of only 0·6 and an income elasticity

[1] F.A.O. Monthly Bulletin, October 1954.

[2] Levie, *Journal of Farm Economics*, November 1954.

[3] *Economic Journal*, June 1930.

of 0·1. By now the price elasticity will probably be lower still.

Dr. Verdoorn[1] gives a number of computed price elasticities for the Netherlands.

TABLE XVI

THE PRICE ELASTICITY FOR SOME SELECTED GOODS IN USE IN HOLLAND

Commodity	Price Elasticity
Sugar	−0·3
Milk	−0·3 to −0·4
Cheese	−0·3 to −0·7
Tomatoes	−0·9
Eggs	−1·7
Cherries	−2·0
Spirits	−1·4
Passenger transport:	
By train	−0·4
By tram	−0·7 to −0·8
Cinema attendance	−1·0 to −1·3
Electricity	−1·4 to −1·7
Bicycles	−1·8
Deliveries of metal industry investment goods	−0·7

He also submits[1] some interesting estimates of elasticity of substitution, or the price elasticity of demand which an exporter must expect when he is in competition with other countries. The figures relate to Dutch exports of various types facing a number of competitors. The results vary widely, but the median is in the neighbourhood of 2.

F. B. Horner (*Economic Record*, June 1949) shows how to determine elasticity of demand for a product at wholesale, or for a contained raw material, given the retail elasticity, and costs of retailing or transformation, which are assumed to be more or less constant. By time-series analysis he has searched for a "pyramiding factor" whereby, owing to fixed mark-ups or other reasons, a

[1] *Grondslagen en Techniek van de Marktanalyse*, 1950.

given change in the price of the basic material leads to a greater change in the price of the finished product (he only finds this for one commodity). In the case of wool he also explores the possibility that price changes may lead to some change in demand for raw material per unit of finished product, but no significant result is obtained.

TABLE XVII

Goods	Market	Competing Countries	Period	Elasticity of Substitution
Butter	England	Denmark, Holland, Australia +New Zealand	1922–1937	2·0
Cheese	England	Holland, Canada+New Zealand	1927–1937	1·2
Cheese	Belgium-Luxembourg	Holland France	1927–1937	2·3
Bacon	England	Holland, other countries	1926–1930 1933–1937	2·7
Chief agricultural products	Belgium	Holland, other countries	1921–1937	1·2
Flowering bulbs	England	All imports	1924–1936	1·5
Hyacinths	United States	„ „	1923–1936	1·0
Bulbs excluding hyacinths	„ „	„ „	1923–1936	0·5
Textiles	Dutch Indies	Holland t.o.v., other countries	1927–1930	2·9
			1931–1933	10·4
			1934–1937	7·1
Printed textiles	„ „	„ „	1927–1933	1·7
			1934–1937	5·5
Boots, shoes	„ „	„ „	1928–1938	2·8
Bicycles	„ „	„ „	1928–1938	1·7
Coal	Belgium-Luxembourg	„ „	1926–Sept. 1931	2·8
			Oct. 1931–1937	1·7
Coke	„	„ „	1926–Sept. 1931	3·6
			Oct. 1931–1937	1·1

This phenomenon of diminished price elasticity of demand for primary products in a period of very low prices is of considerable importance. It may indeed make it impossible to bring about, by normal processes of competition, recovery from a deep depression.

A study of the demand for housing in U.S.A. by Professor Bowen [1] by means of time series yielded obviously

[1] *Economic Journal*, June 1940.

unsatisfactory results. But the much more reliable method of comparing the average amount of housing space occupied at any one time by the inhabitants of different cities, where both rent and incomes differ, indicates an income elasticity of 0·6 and a price elasticity of 0·45. A similar method in the Netherlands indicates a price elasticity as high as 1·3. In Melbourne Professor Prest

TABLE XVIII

	Wool Garments and Wool				Wheat (Human Consumption) U.S.A.		Butter U.S.A.		Meat U.S.A.	
	U.K.		U.S.A.							
Retail price elasticity	−1·0		−1·0		−0·1		−0·4		−0·4	
Income elasticity	1·1		1·1		0·05		0·6		0·4	
Pyramiding factor	1·0		1·0		1·2		1·0		1·0	
Transformation costs	202d. per lb.		$4·74 per lb.		*$3·78 per bus.		$0·05 per lb.		$0·62 per lb.	
	Pence per lb.	Elasticity	Cents per lb.	Elasticity	Cents per bus.	Elasticity	Cents per lb.	Elasticity	Index (1926 =100)	Elasticity
Wholesale price elasticity at various price-levels (wholesale)	13·5	−·26	60	−·21	50	−·015	20	−·32	65	−·20
	18·0	−·33	66	−·27	78	−·02	28	−·34	83	−·23
	22·0	−·43	90	−·49	100	−·025	40	−·36	100	−·25
	45·0	−·93	120	−·90	..	..	..	..	..	..

(*Economic Record*, June 1945) obtained income elasticity of demand for housing of about 0·65. The indications are that it is higher for the large families and lower for the small families.

Demand for certain basic materials, and their price elasticities, requires considerably more study than they have yet received. A long-period review of British consumption since 1850 was made by Mr. Christopher Saunders.[1] Consumption of textile fibres (including a considerable use for the manufacture of export goods) reached a maximum in 1907–13 and is now very much lower; on the other hand, the consumption of rubber has a strong upward trend.

[1] *Journal of the Royal Statistical Society*, Part III, 1952.

The fall in British demand for textile fibres has been accentuated by the decline of exports. But the rate of growth of demand of the world as a whole for textile fibres as for minerals is very much slower than the rate of growth of real product.

TABLE XIX

LONG-PERIOD RATES OF GROWTH OF WORLD DEMAND FOR FIBRES (PER CENT PER YEAR)

	Cotton	Wool	Silk	Flax	Jute
1911–13 to 1927–29	1·2	1·5	5·1	0·1	0·7
1927–29 to 1937–39	2·1	0·7	−0·5	3·4	−1·9
1937–39 to 1952–53	1·2	0·8	*	−0·7	0·0

* Very heavily downwards.

The consumption of soft wood timber in U.K. reached a first maximum in the period 1897–1906, and then another in the period 1933–36. This represents partly changes in the rate at which houses are built, and partly, for any given amount of house-building, a measure of the economy or diseconomy in the use of timber. This latter change can be approximately measured by computing soft wood timber consumption in standards per annum per person at work in the building and construction industries, with the results as shown in Table XX.

The remarkable economies which are being effected now that timber prices are relatively high, and under a certain measure of Government pressure, can be clearly seen.

A little more may be said about the demand for timber — not an attempt to make a complete market analysis, but to establish some of the orders of magnitude.

The world consumed,[1] in 1947, 1453 m. cubic metres (about 1000 m. tons) of "round wood". This measures the total volume of the log as cut; that which is converted into saw timber loses a proportion of its volume which

[1] Leloup, United Nations Scientific Conference on the Conservation and Utilisation of Resources, 18th August 1949.

varies with the size of the log, the wastage being least with the largest logs. When wood is used for fuel or pulping the whole of the "round wood" can be used.

Of the total world utilisation, as much as 825 m. cubic metres were for fuel, 360 m. were sawn, 119 m. used for pulp and the balance for "industrial wood" (posts, pit props, etc.). Generally speaking, it is the smaller

TABLE XX

U.K. Timber Consumption

1851–56 .	0·76	1883–90 .	1·49	1919–23 .	2·01
1857–63 .	0·87	1891–96 .	1·65	1924–28 .	2·08
1864–70 .	1·19	1897–1906 .	1·81	1933–36 .	2·15
1871–77 .	1·43	1907–13 .	2·11	1948–50 .	0·85

trees which cannot be sawn without considerable wastage which are used for pulp wood, but even so the proportion of the world timber cut devoted to these uses is remarkably high. Some, though not all, of the trees so cut could be allowed to grow larger and be preserved for saw timber if wished.

While wood pulp is produced for export or for sale at a distance, fuel wood, being costly to transport, is generally only produced for consumption in the immediate neighbourhood. High consumption of fuel wood is therefore only found in countries where forests are relatively abundant. It is 0·41 cubic metre per head per year in North America, 0·72 in Russia, 0·92 in Latin America and 0·78 in Oceania.[1] This form of consumption will obviously check itself as soon as timber becomes scarce. But the consumption of saw timber is highly flexible too. When it is cheap it is used abundantly for house-building and other purposes, which could be served by other materials if timber were expensive. Thus, in the U.S. consumption of sawn timber for the last twenty years has been about

[1] Data computed from tables submitted by F.A.O. to World Population Conference, 1954.

0·6 cubic metre per head per year — much the same as it was in 1880, when the country was much poorer and means of transport lacking. In the nineteenth century consumption per head rose rapidly to a maximum in 1904 of about 1·45 cubic metres per head. It was just about this time that the first President Roosevelt (justifiably) expressed himself as seriously alarmed at the prospect — the rate at which timber was being cut was several times greater than the rate of natural growth. No attempts were made to restrict consumption, but scientific forest conservation and re-planting were encouraged to increase the growth rate. Consumption fell fairly rapidly as the price rose, but in 1922 the U.S. Department of Agriculture still computed that growth was only 170 m. cubic metres per annum and depletion 700. By 1940 a further heavy fall in consumption and a moderate increase in growth had brought the two figures practically back into balance over-all (the growth figures included a high proportion of small trees).

A very similar experience was shown by Canada where consumption per head is now 0·70 cubic metre of sawn wood, the highest in the world. Sweden, which had a consumption per head of 1·1 cubic metres in 1928, has now reduced her consumption right down to 0·35.

The general conclusion to be drawn is that, while it might be possible eventually to estimate the income elasticity of demand and the saturation demand for timber, the demand for this commodity is particularly sensitive to price changes, of which more are to be expected in the future.

The rates at which timber supplies can be replenished by forest management are found to vary enormously. In cold or dry climates growth will be about 1 cubic metre per hectare per year, but in the temperate zones of Europe or North America this figure may be 3–5 cubic metres. For tropical forests the figure rises to 15 (these, however, will mainly be hard wood which is less economically valuable than soft wood.) The record figures of growth are for some selected species of pine and eucalyptus (the last are

generally for use as fuel wood though some of them are good for building). The figure may rise as high as 20 cubic metres per hectare per year.[1]

It is apparent, therefore, that the world will have considerable flexibility in meeting any foreseen increase in the demand for timber if care is taken in good time, and the right species and the more favoured warm humid areas chosen as planting sites. The relative advantage of these areas over the colder climates is much more marked in the case of forestry than in the case of agriculture; and so, if the Law of Comparative Advantage still holds, we should expect a gradual movement of the world's forestry in the direction of the Equator, balanced by a movement of the world's agriculture in the direction of the Poles.

Probably for no commodity has there been so much misunderstanding about demand as in the case of energy, or fuel (we can treat the two concepts as synonymous). One well-intentioned statistician after another has prepared tables and diagrams correlating real product, by times or by countries, with energy consumption, and has proceeded triumphantly to demonstrate that an increased use of energy and of power machinery is a necessary (some go so far as to imply the only necessary) condition of economic advancement.

But when we come to look at the evidence, a very different picture emerges. The rate of increase in the demand for energy, like the rate of increase in the demand for certain basic minerals and textiles, is slowing down, relative to the rate of increase in world production. Many people, including professional engineers, are deceived by the rapidly increasing demand for energy in its electrical form, not realising that this is replacing other forms of energy demand. M. Guyol, of the United Nations Secretariat, in his paper on fuel requirements at the World Population Conference of 1954, pointed out that between 1860 and 1910 world fuel demands were increasing at the

[1] Still higher figures have been reached when coarse quick-growing types of eucalyptus are grown specifically as fuel wood (see below).

rate of $4\frac{1}{2}$ per cent per annum, but from 1910 to 1950 at the rate of only 2 per cent per annum. But he seemed to think that there was something wrong with this result, and claimed that the demand would soon again be increasing at an accelerated pace.

Mr. Schumacher, in his paper to the same Conference, expected that world demands, from now onwards, would expand at the rate of 2 per cent per head of population, or some $3\frac{1}{4}$ per cent per annum in all.

A still stranger distortion was introduced into the conclusions of the Paley Report to President Truman in 1952. The U.S. demand for fuel was reckoned not in calorific values, but in dollar values, which of course gave a far higher weight to liquid and gas fuels than to solids. On this basis a very rapidly increasing demand was projected, diverting attention away from the very slow increase of demand measured in calorific value.

Not quite so high a rate of growth in the demand for energy was expected by Sir John Cockcroft in his address to the United Nations Conference on Atomic Energy, 1955. He expected world demand to increase at the rate of 2 per cent per annum up to 1975, and by 2·8 per cent per annum in the next 25 years. By the end of the century he thought that half the world's demand for energy would be in the form of electric power. Of the world's total demand, by that time, he thought that nuclear energy would still only provide about one-third and hydroelectric energy less than 15 per cent.

The demand for electrical power in industry, per worker engaged therein, varies very greatly between countries. A recent calculation[1] showed this figure as 27,400 kwh. per year in Norway, 13,900 in the U.S. and 12,500 in Sweden, countries in which power is cheap — down to figures such as 4000 in the U.K. and 3400 in Denmark. A comparison of different regions in the U.S.[2] showed that, where y represents power consumption in

[1] Published by E.C.O.S.O.C., 15th April 1954.

[2] National Resources Planning Board, "Industrial Location and National Resources", 1942.

manufacture per wage-owner engaged in kwh. per year, and x its price in cents per kwh., then

$$\log y = 3{\cdot}805 - 1{\cdot}062 \log x.$$

The Statistical Department of the United Nations[1] have estimated fuel consumption in every country for various dates since 1929, expressing all fuels (including hydroelectric power) as their equivalent in tons of coal. In view of the extreme uncertainty of the information they decided not to make estimates for use as fuel of firewood, peat, refuse and dung (which are important in certain countries). They estimated that in a simple agricultural community in which no mineral fuel is used, fuel consumption of this nature will average the equivalent of a $\frac{1}{4}$ ton of coal per head of population per year. Data for earlier years are obtained from Mr. P. C. Putnam's *Energy and the Future* with his definitions adjusted to fit the United Nations figures for 1929. Mr. Putnam has made estimates for the consumption of wood and other non-mineral fuels.

In order to test whether fuel demand is increasing more or less rapidly than national product in general, this demand is expressed in terms of kilograms of coal equivalent for each I.U. of net national product at various dates.

This table brings out a striking tendency for the fuel consumption required per unit of real national product to rise to a maximum and then to fall. Countries, however, differ materially in the dates at which this maximum was reached. In the U.K. it was reached as early as 1880, in the U.S. about 1920, in France and Belgium in 1929. In Germany there appears to have been a plateau between 1913 and 1929, followed by decline. In Argentina, Australia, Russia, Japan and South Africa the figure still seems to be rising, but very slowly.

The difference between countries and times can in part be explained by the extent to which a country occupies itself in what are generally called "heavy industries"

[1] Statistical Papers Series J; brought up to date in *International Statistical Year Book.*

demanding considerable fuel consumption (steel, chemicals, pottery and bricks, etc.); and also by the extent to which economy is exercised in all operations using appreciable quantities of fuel, including household use. Both these factors might be expected to be considerably dependent on

TABLE XXI

FUEL CONSUMPTION IN KILOS OF COAL EQUIVALENT PER I.U. OF NET NATIONAL PRODUCT

	1860	1870	1880	1890	1900	1913	1920	1929	1937	1950	1953
Argentina	..	..	..	..	..	..	1·50	2·30	2·50	2·75	2·65
Australia	..	..	..	..	..	4·60	..	3·77	4·59	4·90	5·40
Austria	..	..	..	..	..	..	..	6·53	4·68	5·75	..
Belgium	..	..	..	..	..	11·20	..	14·80	12·15	7·26	..
Brazil	..	..	..	..	..	..	..	1·10	0·82	1·10	..
Canada	..	..	..	..	..	..	..	8·68	8·88	7·68	..
Chile	..	..	..	..	..	..	..	3·92	2·29	2·78	..
Denmark	..	..	..	..	..	..	..	3·09	2·90	3·11	..
France †	2·49	3·35	4·13	4·25	5·05	6·49	..	6·49	4·15	4·51	4·46
Germany	1·78	..	4·01*	5·05	6·90	8·75	..	8·71	6·32	7·41	6·91
Greece	..	..	..	..	..	..	..	0·73	0·90	1·36	..
Italy	..	..	..	..	..	..	..	3·23	3·52	2·53	3·17
Japan	..	..	..	..	..	2·75	3·90	3·90	4·15	4·02	4·16
Netherlands	..	..	..	..	..	..	..	4·74	4·20	3·73	..
New Zealand	..	..	..	..	..	..	..	3·18	2·59	2·57	..
Russia	..	..	..	..	..	3·16	..	2·03	4·64	7·30	7·30
Switzerland	..	..	..	..	..	..	..	4·43	4·44	3·56	..
Union of S. Africa	..	..	..	..	..	..	..	7·06	7·42	7·62	..
United Kingdom	10·48‡	10·70	12·35	8·55	9·19	8·24	9·11	8·25	7·36	8·05	7·60
United States	1·68	4·65§	5·28§	6·93§	8·98§	10·80	11·18	9·14	8·39	7·17	7·01

* 1877.
† Pre-1929 data from *Économie et Humanisme*, May-June 1953.
‡ 1854.
§ Average of decade centred about 3 years after date indicated.

the price of coal. Heavy industries will naturally grow up in countries where it is cheap, and not where it is expensive. But the extent of price rise necessary to permit fuel economy, and the number of years which it would take to effect it, will vary considerably. Countries in which fuel is extremely expensive, such as Italy and Argentina, can have a fairly well developed industrial economy with a consumption of only about 3 kg. per I.U. Japan and France can even show a considerable development of heavy industry with consumption not very much higher.

The following table[1] measures the change in the relative price of coal for a number of countries:

TABLE XXII

I.U. EQUIVALENT OF PRICE OF ONE TON OF COAL

	1886	1913	1924	1929	1936	1949	1953
Belgium	3·52	6·65	5·86	4·79	4·24	6·89	..
France	4·86	6·02	4·85	4·70	6·06	5·14	8·68
Ruhr	2·42	5·25	4·96	3·86	4·91	4·09	9·65
Netherlands	..	..	..	3·86	3·98	..	..
U.K.	2·55	4·50	4·66	3·58	4·19	..	10·82
U.S. (bituminous)	1·87	1·71	2·24	1·81	2·25	3·40	2·65
Italy	..	..	..	..	..	..	17·71
South Africa	..	..	..	..	..	..	1·07

These figures generally relate to coal at the pit head and of course would be much higher if we measured the price of coal at distant consuming centres. But they show how rapidly upward is the long-term trend of prices and how strong therefore should be the incentive to fuel economy.

Earlier figures show no great difference from the 1886 figure for Germany, but for Britain they show a marked turning point with prices falling to their minimum, in real terms, about 1880. As prices rose, the fall which followed in fuel consumption per unit of product was rapid. It was about this time that important fuel-saving changes in steel technology began to be introduced, and while some of these discoveries may have been fortuitous, the rising price of fuel must have helped to promote their application. But further savings of fuel have proceeded very slowly; the consumption of fuel per unit of product in present-day Britain is not much lower than it was in 1913. Thus in recent years we have had the paradoxical result that fuel

[1] Based on data in *Bulletin of the Economic Commission for Europe*, vol. 2, No. 2, and *United Nations Monthly Bulletin of Statistics*. Except for data for the U.S., values given in dollars are converted to I.U. through sterling at the then prevailing exchange rate, as sterling prices are more indicative of prices prevailing in international markets than dollar prices.

consumption per unit of product is now lower in the U.S. than in Britain.

In South Africa, which now probably has the cheapest coal in the world, a high consumption figure is seen.

When dealing with the orders of magnitude of fuel reserves it is convenient to use a very large unit, known to the scientists as a Q, defined as 10^{18} B.T.U. (or the equivalent of 37 billion tons of coal). The entire world's consumption, according to Mr. Schumacher, was only 1·1 Q between 1855 and 1904, 3·3 Q between 1904 and 1954, and is now at the rate of 0·1 Q per year. Oil reserves are estimated by both Putnam and Schumacher at 6 Q; economically usable coal reserves are estimated by Schumacher at 30–40 Q; by Putnam, under the more precise categorisation of coal accessible at not more than twice present costs (because beyond that cost it will be unable to compete with nuclear energy), at only 21 Q. Schumacher considers that all the natural oil resources will have been used up by the end of the century, and liquid fuel used after that date will all have to be produced by synthesis from coal — at a cost much higher than that of present-day liquid fuels (untaxed prices).

Mr. Putnam discusses the hypothesis, favoured by some cosmologists, that originally there was no oxygen in the earth's atmosphere, but only carbon dioxide (as is apparently the case in the atmosphere of some of the planets), and that free oxygen was only formed as a by-product of photosynthesis by plants. If this is true, he is able to show that there must therefore be still 10,000 Q of coal reserves somewhere. However, we must not set out to burn them up too fast, even if we do find them, at any rate not faster than the rate at which the carbon dioxide can be reconverted by photosynthesis — otherwise we will not have enough oxygen left in the atmosphere.

The solar energy falling on the earth's surface in the course of a year is no less than 675 Q — equivalent to 1700 tons of carbon per hectare per year — so we can have plenty of energy from that source, if we know how to tap it. Probably the best method, at present, of exploiting

photosynthesis in order to obtain energy is by use of quick-growing fuel woods, particularly eucalyptus,[1] which in a hot climate will yield 25 tons of wood (equivalent to 12½ tons of coal) per hectare per year. On this basis, 2000 hectares of forest could permanently fuel a plant generating 10,000 kw. But, if a mirror or other device could be designed for economically collecting and focusing the sun's radiation direct, 50 hectares would suffice to generate the same energy. The best solar engine which could be designed at present would cost, it is estimated, 1·6 cents per kwh. generated, or more than twice present costs. However, the newly discovered silicon battery, which can obtain energy direct from sunlight, yields 50 watts per square metre, so the 10,000 kw. plant would only require 20 hectares of catchment to keep it operating — during the hours of sunlight. This may be the future source of energy for sunny tropical countries — with some storage to meet the night load. Indeed, batteries spread out on the roof of an average-sized house would collect 5 kw., ample for all domestic requirements (with some storage).

Most natural forms of photosynthesis are much less productive than the eucalyptus — the average rate of photosynthesis [2] by algae per hectare of ocean surface, for instance, is only 5–10 per cent of this. (However, it rises to 7½ tons of carbon per hectare per year in a few favoured areas, such as the Benguela Current, where there is an upwelling of deep ocean water rich in nutrient salts.) Cultivated algae [3] can yield 37 tons of dry matter (at a present cost of $550 per ton) per hectare per year, and it is expected that eventually the yield can be raised to 85 tons.

[1] *Fortune*, September 1953.

[2] *Science Today*, 3rd May 1951, describing the results obtained by the Danish oceanographic research ship, using an ingenious method of measuring by means of radioactively labelled sodium bicarbonate.

[3] Prof. Farrington Daniels, World Population Conference, 1954.

CHAPTER IX

THE DISTRIBUTION OF LABOUR BETWEEN INDUSTRIES

We have found it desirable to subdivide the economic process, in order to examine its workings in more detail, into three major divisions, whose boundaries can be drawn in a common-sense but nevertheless fairly precise manner. There are some quite wide and important differences between the general economic laws under which the three divisions operate.

The first division is agriculture. With this we include all forms of grazing, including nomadic grazing; the business of obtaining meat and skins by hunting and trapping, in most parts of the world now only carried on on a very small scale indeed; and the much more substantial business of fishing. It is also convenient to include forestry at this stage. Mining is a border-line case, which is sometimes included here, sometimes with manufacture, and which perhaps deserves a class to itself.

The common feature about all the above, of course, is that they all depend upon the direct and immediate utilisation of natural resources. By their nature, therefore, they can only be carried out at the point where the natural resources are — one of the most important considerations distinguishing them from manufacture. Most (but not all) of their processes are rather slow, particularly the process of animal breeding. We have seen how rapidly their technique can improve, but for any given form of technique, all other things being equal, agricultural processes, with one or two exceptions, must be carried out under a Law of Diminishing Returns. This applies still more to fishing, and in most cases it appears to apply to mining. The only exceptions to the Law of Diminishing Returns appear to arise in a highly mechanised process, greatly dependent upon mechanical and scientific auxiliaries, such as modern sugar production.

The next class which it is convenient to take by itself, namely manufacture, has been defined as a process, not using the resources of nature directly, producing, on a large scale and by a continuous process, transportable goods. This definition excludes the production of untransportable goods (buildings and public works), and small-scale and discontinuous processes such as the hand tailoring of clothes, or shoe-repairing. The essential nature of manufacture is that both its materials and its products can be transported for considerable distances if required, that it requires fairly substantial capital investment and a high degree of organisation, and that in most cases it is carried on under a Law of Increasing Returns.

The remaining group of economic activities is most conveniently described as "service industries".[1] These naturally group themselves further into building and construction; transport and communications; commerce and finance; professional services; public administration and defence; and personal services, of which private domestic service may be distinguished from commercially supplied services, such as cafés and hairdressing.

For national accounting and other purposes, it is necessary to make another distinction which cuts right across each of the above categories, namely between

[1] For some time the phrase "tertiary industries" has been used, but it is suggested that this phrase has now reached the end of its term of usefulness, and might be replaced by the phrase "service industries". It was originated by Professor A. G. B. Fisher in New Zealand, and became widely known through the publication of his book, *The Clash of Progress and Security*, in 1935. It took its origin from the titles current in Australia and New Zealand of "primary industry" for agriculture, grazing, trapping, forestry, fishing and mining, and "secondary industry" for manufacture. In Australia and New Zealand these terms are not only used in statistical reference books but are widely current in popular discussion. The phrase "tertiary industries" therefore immediately carries, in these countries, a suggestion of those excluded by the official definition of "secondary industries". In some of Professor Fisher's writings, however, it appears that he wished the title "tertiary industries" to cover some of the more refined processes of manufacture such as book-printing, and possibly also to exclude some services such as goods transport. His object was to draw his readers' attention to the "growing points" in the economy, namely those industries which, because of high income elasticity of demand for their products, for technical reasons, or because of changing tastes, were likely to grow more rapidly than others. This point of view largely but certainly not completely coincides with the demarcation of service industries as opposed to manufactures.

services supplied direct to the final purchaser (consumer, investor or Government), and those which have to be used to assist other processes of production, such as the transportation of goods, wholesale trading, the services of accountants, or the supply of passenger travel and hotel accommodation for business purposes.

A wide, simple and far-reaching generalisation in this field is to the effect that, as time goes on and communities become more economically advanced, the numbers engaged in agriculture tend to decline relative to the numbers in manufacture, which in their turn decline relative to the numbers engaged in services. This generalisation was indeed first made so long ago as 1691, by Sir William Petty.[1] Petty wrote "there is much more to be gained by *Manufacture* than by *Husbandry*; and by *Merchandise* than by *Manufacture*. . . . We may take notice that as Trade and Curious Arts increase; so the Trade of Husbandry will decrease, or else the wages of Husbandmen must rise and consequently the Rents of Lands must fall". Petty very wisely turned his attention to the outstanding economic fact of the world in which he lived, namely, the achievement by the Dutch of economic standards so much higher than those of England, France and their other neighbours. His analysis of this question is realistic, and makes fascinating reading to this day. He found good Government to be a significant factor in their prosperity, but he specially goes out of his way to commend the economies arising from a dense population. After a century and a half of Malthusian propaganda we come to regard dense populations, including our own, with some suspicion; and have lost sight of the obvious

[1] Sir William Petty, whose writings on economics and statistics are not as widely known as they should be, was one of the most fascinating figures of the seventeenth century, for the extraordinary range of his achievements in both learning and action. The fact that he changed sides twice over the Civil War and Commonwealth period should not be held against him, because most of his contemporaries did the same. During the Cromwellian purge of Oxford he received a Fellowship of Brasenose College for his knowledge of medicine, and later became Cromwell's Surveyor-General in Ireland, with the task of distributing confiscated land among Cromwell's soldiers. But this did not prevent his becoming a favourite of Charles II in the succeeding reign.

fact that, until a certain degree of population density has been attained, no civilisation at all is possible; and that many of the refinements and economies of civilisation only become possible under conditions of much higher population density. Petty pointed out the significant economies which the Dutch enjoyed, not only in transport, but also in public administration and the provision of professional services, through their close proximity to one another and the absence of long distances.

It soon became apparent to him that this high degree of economic development was associated in the Netherlands, and by implication would have to be associated elsewhere, with the employment of a large proportion of the working population in manufacture and in commerce, rather than in agriculture. Indeed in England, as he pointed out, the value of a seaman, as measured by his wages, at 12s. a week, was three times that of a farm labourer; and the line of development for a country which wished to advance would be to develop its manufactures and commerce, and, if necessary, import its food. "So as a Seaman is in effect three Husbandmen, wherefore there is little Ploughing and Sowing of Corn in Holland and Zeeland, or breeding of young Cattle." Even at that date, a large proportion of Dutch food supplies were imported from what were then rather sparsely populated areas, in Westphalia and Denmark.

Fully recognising the value of this work, we must nevertheless subject it to a more refined analysis, in the light of modern theoretical and statistical knowledge. The problem is, how the distribution of the labour force between these three fields will be affected by increasing real income per head. The problem falls into two parts. As real income per head increases, it is quite clear that the *relative* demand for agricultural products falls all the time, and that the relative demand for manufacture first rises, and then falls in favour of services. This generalisation remains; though it should be pointed out that, if we confined our analysis to consumers' services alone, we would not, in the United States and other wealthy modern communities, get quite the same result. At the prices which now have

to be paid for them, these services direct to consumers are not showing a high marginal demand, relative to that for other goods. If, on the other hand, we include that large and increasing range of services which are now supplied to business, we again conclude that the relative demand for services, as a whole, is increasing.

Given these expected changes in demand, we also have to take into account the efficiency with which the different industries will work to supply them. Real product per man-hour in manufacture, for example, nearly always advances at a greater rate than real product per man-hour in other sectors of the economy. For that reason, a *stationary* relative demand for manufactures would lead to a *decreasing* proportion of the labour force employed therein. Even when the relative demand for manufactures is increasing, we still generally expect, in the long run, a decreasing proportion of the labour force to be employed therein.

Agriculture, in all but the most primitive societies, shows a fairly steady tendency towards increasing product per man-hour, though not usually as rapid as in manufacture. With the steadily decreasing relative demand, this can be counted on to produce a steadily declining agricultural proportion of the labour force.

It is in the field of the service industries that there has been some doubt. In the past, it has sometimes been erroneously stated that little, if any, increase in real product per man-hour was possible in these industries, from which it was deduced that their relative importance in the labour force was bound to increase rapidly, even if the relative demand for services were stationary. Recent critics in this field have drawn attention to the very great improvements in efficiency which these service industries can show in an advancing economy. Apart from obvious improvements in the efficiency of transport, we should also notice that the processes of commerce, in a primitive society, are extremely time-wasting in comparison with Western methods. The simple reasoning stated above is therefore invalid. It must be replaced by the more cautious generalisation that, while the efficiency of transport and

commerce, in certain stages of a country's economic development, may advance even more rapidly than those of manufacture, yet nevertheless it seems to be the case that the demand for these services, at such times, increases more rapidly still, and that therefore the proportion of the labour force occupied in them shows still a tendency to increase.

We must now deal with some questions of statistical method before we can compile and examine the tables.

In the first place, we must settle the distinction between "industry" and "occupation". This is a distinction now clearly understood in modern Census tabulations of industrial countries; but this distinction was only introduced, e.g. in Great Britain, in 1921, and even later in some of the other industrial countries, and there are many countries in the world in which it has not been introduced yet. A man's "occupation" is the nature of the work he actually does; his "industry" is defined by who he does it for. We can imagine, for instance, a large electrical works employing a truck driver to cart their materials around for them; and we can imagine a large road haulage business employing an electrician to do their maintenance work on their vehicles. The former man is occupationally a transport worker but industrially an electrical worker, the latter is occupationally an electrician and industrially a transport worker. It is clear that, for the purposes of our present analysis, our first object must be to examine industrial rather than occupational distribution; though once we have established generalisations regarding industrial distribution of the labour force, we shall then wish to turn to a more detailed occupational study.

For the countries and times for which correct industrial distributions are not available, less accurate estimates, based on occupational tables, have to be used.

The only valid source of information in this field is from Census returns. In recent years, in some countries, widespread and extensive sample inquiries, outside the normal Census years, have been taken by public authorities. But even so it is doubtful whether any of these yet can be

regarded as equally reliable with the Census itself.

The next difficulty which arises, in comparing Census returns of different countries, is the very varying statistical treatment of the women members of farm families. In France and Germany, for instance, practically every woman member of a farm family is recorded in the Census as being engaged in agriculture, whereas in U.S.A. and Denmark only women actually earning cash wages are included. It appears that in some other countries an intermediate convention is adopted. This discrepancy is so serious that the only possible procedure at present is to omit completely, from every Census result, all recorded figures of women engaged in agriculture and fishing.

Table III records two sets of figures. The first is the industrial distribution of the whole labour force, excluding all women recorded as engaged in agriculture and fishery, and classifying those recorded as unemployed at the Census date with the industry to which they normally belong (other than in one or two exceptional cases where there are large numbers of unemployed whose normal occupation is not clear, or appears to be mis-stated). The percentage classification excludes those whose industry is unknown or insufficiently described, though their numbers are included in the labour force.

The other set of data (recorded in italics in the table) show, on all occasions for which adequate Census information is available, the proportion of the numbers engaged in each industry who are employers or workers on their own account, i.e. working proprietors, or those who own their own means of production. This measure is designed to include only those who actively control their own businesses, either individually or in partnership, but to exclude those who work, whether paid or unpaid, for their own families as employers.

We may first observe that the data support the generalisation that a high proportion of the total labour force engaged in agriculture and associated forms of employment is only to be found in economically undeveloped communities, and that in an economically

developed community there is almost invariably, through time, a tendency for this proportion to fall. A failure of this proportion to fall can generally be attributed to some temporary, or occasionally more permanent, economic difficulty.

It is of great interest and importance to determine the maximum proportion of the population likely to be found engaged in agriculture and fishing in the simplest economies, but unfortunately (as was only to be expected) the information is far from precise. Professor Buck's *Land Utilization in China* inquired into, amongst other things, occupations. In his sample study of a large number of Chinese villages in the 1930s he covered altogether villages with an aggregate population of 109,000, which had a population of 44,600 occupied males, and 1700 females occupied other than in agriculture. Of this labour force 62 per cent were fully occupied in agriculture, 24 per cent fully occupied in non-agricultural activities, and 14 per cent mainly occupied in agriculture, with subsidiary activities in manufacture, trade or transport. It looks as if the over-all percentage of working time devoted to agriculture and fishing should be placed at about 73 per cent. Moreover, this is a purely rural sample, and, if Chinese towns and cities were included, the proportion might fall to nearer 70 per cent.

A careful and detailed study of the Census returns, and field inquiries, in Honduras, one of the least-developed of the Central American republics, by Dr. D. Ross of Harvard (results privately communicated), indicates that the proportion of the labour force engaged in agriculture and fishing, defined in this same way to exclude women attributed to agriculture and fishing, should be placed at about 72½ per cent.

In problems like this a micro-study is often more useful than a macro-study, and we should take note of the very careful inquiry carried out by Mr. Sol Tax [1] on the life of an Indian village in Guatemala. The village concerned was dependent upon settled agriculture, not

[1] Smithsonian Institute of Social Anthropology, *Publication No. 16*, Tables 16-22.

2 K

upon fishing or nomadic herding, but carried out in a very primitive way. Omitting the work done by children under 14, and omitting agricultural work and housework undertaken by the women, it appears that the average woman spends a little over one hour a day in occupations other than agriculture and housework, but of the five hours a day which she devotes to housework an undetermined proportion will represent "domestic production" (of textiles, household goods, etc.). However, if we include only this one hour of specifically commercial activity, and add it to the ten and one-half hours which constitute the average man's day, we get a total working period of eleven and one-half hours, of which 8·7 hours, or 75 per cent, are devoted to agriculture, animal husbandry and fishing. This is for a purely village economy and the inclusion of even a few small towns would lower this proportion.

In round figures, it looks as if we should take the proportion of 75 per cent as a maximum. If ever a higher proportion is shown, we may suspect that there has been some mis-description of those people who are predominantly occupied in agriculture, but have also substantial subsidiary activities.

Reading down the column for agriculture, forestry and fishing in Table III, it is interesting to notice, first, an increase in the proportion occupied in agriculture in the Argentine between 1914 and 1947. This indicates a certain degree of economic disorganisation (the mere fact that no Census was taken over this long period might also perhaps indicate that there was something wrong). It may be suggested that the original proportion shown for 1914 was incorrectly low; but it is similar to that shown by Australia for the same date, and is not improbable for a wealthy modern agricultural State.

In Austria the sudden fall between 1910 and 1930 is of course due to boundary changes, and the exclusion of large agricultural areas of the former Austrian Empire. The rise between 1920 and 1934 indicates a substantial degree of economic disorganisation; but between 1934 and 1951 there has been a satisfactory fall.

Belgium deserves note as showing, after Britain, the next lowest proportion, though very shortly the United States will overtake her in this race. Before very long, if present trends continue, the United States will have as low a proportion as Britain.

A good deal has been heard about the over-population and economic difficulties of Egypt, but the downward trend in the agricultural proportion of the labour force has been quite marked, though interrupted between 1917 and 1937.

For India, on the other hand, we find a trend very different from that of other countries. The data unfortunately are still very obscure, in spite of Mr. Ghate's heroic efforts to produce them to order. But it appears that there was a really marked *increase* in the proportion engaged in agriculture between 1881 and 1911, and that the proportion has been virtually stationary since that date. But we know, from the data given in Chapter III, that the period 1881 to 1921 was one of increasing real income per head, though the movements have been slight since that date. The paradox is explained by two events peculiar to India's economic history. Railway building was started rather late in India, and in 1881 a good deal of the country was still dependent on primitive methods of transport and communication. Transport costs were so high that most districts had of necessity to be economically self-contained, which required the employment of large numbers of handicraftsmen of different kinds. As modern means of transport and communications spread through the country they effected drastic economic changes, greatly turning the terms of trade in favour of agriculture. Very large numbers of handicraftsmen were displaced by cheap manufactured goods, at first from abroad, but to an increasing degree manufactured in the large coastal industrial cities; while cheap transport opened up lucrative export markets to the agriculturists, whose numbers were further increased by the large-scale irrigation works commenced in the 1880s. (India at that time — not, of course, now — had a large net export of farm products.)

Another paradox is provided by Ireland, where the

agricultural proportion rose quite rapidly from 1871 to 1926, over a period in which we know real income per head to have been substantially rising, not falling. This is explained by the unusual circumstance of a substantial *decrease* in the total population. The farm population of Ireland decreased rather less rapidly than the urban population, and those remaining enjoyed a rapidly increasing real income. Since 1926 the decrease in total population has been checked, and an increased degree of industrialisation has been promoted by Government action.

The extraordinary rapidity of the fall in Japan, between 1872 and 1940, should be noticed, and gives an indication of the rate of economic development which a country, even though starting from a very primitive level, may attain if it really gives its mind to the task. The much higher figure for 1950 is a measure of the injury which the Japanese economy has received, and from which it has as yet by no means fully recovered.

It is only rarely that mining occupies more than an insignificant proportion of the labour force, even in countries which are important exporters of mineral products, such as Australia, Mexico and Peru (such mining is generally carried out by efficient modern methods, and the labour requirements are not high). Conditions such as prevailed in New Zealand in 1861, when mining occupied a third of the entire labour force, which, however, only consisted of 40,000 workers all told, must clearly be regarded as exceptional. Gold had just been discovered in what had hitherto been a virtually uninhabited country.[1] In Australia the proportion rose to a maximum in 1901 (the discovery of the rich West Australian goldfields came much later than the original gold rush of the 1850s) and since then has declined rapidly. It is indeed interesting to see that in no country except South Africa has the proportion of the labour force engaged in mining been as high as it was in Great Britain in the period 1911–21.

[1] The present writer has spoken to an old man at Queenstown in New Zealand, a district in which gold mining has long since been abandoned, who remembers prospectors paying £100 in gold for a seat on the coach from Dunedin, in order that they might arrive to stake out an early claim in the gold rush.

Not only was Britain at that time a very large coal exporter but also used, rather wastefully, enormous quantities of fuel in her own industries. For similar reasons the United States mining proportion rose to a maximum in 1920, and has also since declined heavily.

The proportion of the labour force engaged in construction is an interesting figure which, unfortunately, we cannot study as much as we might wish, because the Census records often fail to distinguish it from manufacture. In the poorest economies the figure is only about 2 per cent. This is the order of magnitude to be expected, if we take account of the fact, established in Chapter II, that people at the lowest real income levels tend to spend only about 6 per cent of their income on housing. Even if we assume that these poor houses require a great deal of repair and have to be replaced very frequently, and even if we make a very substantial addition for requirements of commercial and public buildings, it is still hard to see how more than 2 per cent of the labour force can be occupied in construction under these circumstances. In some tropical countries, e.g. Malaya and Thailand, the proportion falls much lower still. In the really hot tropics only a minimum of housing is required, and there is an abundance of palm leaves and other natural material available.

In modern industrial countries the proportion seems to range between 4 and 7 per cent, but naturally is highest in the rapidly developing countries. The Australian figure of 13 per cent for 1891, just at the close of the extraordinary boom of the 1880s, was quite exceptional, and has never been repeated. In the United States the rate of development, by this measure, was always less rapid.

The course of the figure for manufacture (with which we include the production of electricity and gas) is of the greatest interest. The highest figures are shown by Britain and Belgium, with Switzerland a close runner-up, and Sweden rapidly increasing. The British figure is now almost exactly the same as it was a century ago, having during the intervening period dipped slightly and then risen again. But Britain, Switzerland and Belgium are all

countries whose economy largely depends upon the export of manufactures. In the United States, where the net export of manufactures is comparatively small in relation to total output, the proportion engaged in manufacture rose gradually to a maximum in 1920 and then showed signs of a decided fall. However, the figure for 1950 has risen to a new maximum, though still a great deal lower than that prevailing in the principal industrial countries of Europe. This cannot be discounted by claiming exceptional circumstances of the Korean war, as the United States Census was taken in April 1950, two months before the war began. It may still be remarked, however, that other exceptional circumstances prevailed in 1950. Orders were still high to make up war-time arrears of industrial equipment, and also of consumers' durable goods. The best forecast that can be made, when we look further into the future, is that the proportion will probably remain stable at somewhere about the 1920 level. A fairly long-run stability of this proportion is found, not only in Britain, but also in Belgium since 1910, in Germany for half a century, in Switzerland and France for nearly a century.

As against these established industrial countries, we have another category where the proportion engaged in manufacture is still rising. Sweden, at the pace she is now going, will soon be as fully industrialised as Germany or Britain. In Norway, on the other hand, we apparently find a high figure for industrial population in 1900, which subsequently falls, and more recently has risen again. But this high figure in the earlier years must surely be explained by the survival of a large number of handicraft workers, at a time when communications were still poor. Recent development in Norway has been rapid, but not quite so rapid as in Sweden.

Both Australia and New Zealand had a remarkable bout of premature industrialisation in the 1880s, which cannot be explained by lack of communications. The real costs of sea transport were not seriously higher then than they are now. After this, the industrial proportion fell slightly until the 1930s, the development of both countries

in this period being predominantly agricultural. More recently, there has been a rapid but artificial development of manufacture in both countries, carrying the Australian proportion to a level as high as that of the United States. This is certainly a remarkable figure for a country economically dependent upon the export of agricultural products, and requiring to import a large proportion of her requirements of manufactures; productivity in Australian industry is low, and industry artificially protected.

Canadian development came later than that of the United States. The proportion is now at about the United States level, but may have further increases in front of it.

Denmark is another country where the proportion engaged in manufacture has increased rapidly during recent years at the expense of agriculture. Denmark's economic position bears some resemblance to Australia's.

In Italy we see the combined figures for manufacture and construction at a maximum in 1881, then falling for a long period, and then rising again. Here surely the explanation is the same as in Norway, namely the survival of a predominantly handicraft economy until comparatively recent times. The increase in the industrial proportion between 1936 and 1951, even if we discount a substantial number of construction workers, has been remarkable, and will soon place Italy in the category of the most highly industrialised nations.

In the Netherlands, on the other hand, the industrial proportion has not greatly increased, and by the same token the agricultural proportion has not greatly decreased. The Netherlands — surprising though it may seem, for the most densely populated country in Europe — is a substantial net exporter of farm products.

Transport (with which we include for convenience postal, telegraphic and telephonic communications) might well be expected to be different from the other service industries. It can be almost entirely mechanised, and the prospects for improving productivity per man are immense. It is true that an advancing economy demands greatly

increased quantities of transport, but often this increase is in less rapid proportion than the increase in productivity of transport labour, and the proportion of the labour force which has to be devoted to transport may decline. It has been estimated[1] that as much as 8 per cent of China's entire labour time has to be devoted to transport. This is not an impossible conclusion, when we bear in mind how little mechanical transport, or even animal transport, is available, and how many loads have to be carried in wheelbarrows, or even on men's heads.

In most countries we see the proportion of the labour force engaged in transport and communications tending to rise to a maximum and then fall. The general average, for advanced industrial countries, is about 6 per cent. We naturally expect it to be highest in countries where a sparse but economically advanced population is distributed over a large area, as in Canada, Australia and Norway. But we also expect a high proportion in countries which supply a substantial quantity of transport service to the rest of the world. Norway is also included in this category, likewise Britain in the past, but not so much now; and also Netherlands, Belgium and Switzerland.

The replacement of horse transport by mechanical transport on the roads marks an important turning-point. In Great Britain the proportion of the labour force required in transport reaches a definite maximum in 1901, in the United States in 1920, in France in 1921.

A question is often asked whether, in any very large industrial city, an inordinate proportion of the labour force is not occupied in "moving each other around", i.e. in internal passenger transport. The London transport area in 1949 had a population of $9\frac{3}{4}$ millions, or, say, a labour force of 4 millions. Of these, 100,000 were directly employed by the London Transport Executive. We should raise this figure to about 110,000 to allow for that proportion of all the passenger journeys within the London area provided by the main-line railways. We thus get a

[1] Estimate by Lu Chow-shu, quoted in *Weltwirtschaftliches Archiv*, March 1937.

total figure of 2·7 per cent of the working population, which certainly is substantial in relation to the numbers required for transport as a whole.

(This latter figure, of course, does not represent the entire cost of internal passenger transport in a large industrial city. We must make a further allowance for the construction, equipment, fuel and other materials used up for this purpose.)

Commerce and finance occupy a very low proportion of the labour force in the simpler economies, and seem to show in all cases a rapid increase. The improved methods of organisation which are possible in the provision of these services do not, apparently, keep pace with the increased demand for them.

It is of some interest to separate out the figure for banking in a few countries, showing the numbers employed therein as a percentage of the whole labour force.

U.S.A.	1930	1·30	Germany	1933	0·62
	1940	1·05	Great Britain	1951	0·63
Belgium	1930	1·03	Australia	1911	0·48
Switzerland	1930	1·02		1947	0·85

On the other service industries it is more difficult to generalise and the data are not very satisfactory. The proportion engaged in private domestic service tends to fall. This is one of the few services in which, by their very nature, productivity per hour of labour cannot increase. As a result, when this occupation has to compete for labour with other industries, the price of domestic service is bound to show a steady rise through time, compared with other goods and services, and the demand to be discouraged thereby. This does not apply perhaps quite so much to other commercially provided services (hotels, cafés, etc.). The relative price of these services rises as does domestic service, but the demand for them may be less elastic ; it is often a business rather than a household demand.

It is difficult to avoid some degree of ambiguity in distinguishing between these services and commerce proper. There is also a certain ambiguity between

"professions" and Government service, though the attempt is made to put teachers, doctors, etc., employed in public service with professions rather than Government service. The upward tendency in Government service in many countries is marked.

In Table III are also given all the available figures showing the proportions of the labour force who work as employers or workers on their own account. With the decreasing relative importance of agriculture in almost every country, this proportion tends to diminish, and the consequences for society as a whole may be very far-reaching. Within agriculture itself, however, the proportion of working proprietors often tends to increase, though they form a diminished proportion of the whole working population.

In mining the proportion of employers and working proprietors is naturally always low. In manufacture it is generally only high where a considerable amount of old-fashioned handicraft still prevails, though the high figures for Norway and Switzerland are worthy of notice. In construction, on the other hand, the proportion of working proprietors often shows signs of increase as a country grows more economically advanced. The proportion tends to decrease in transport and communications, and in commerce and finance.

Any sort of general review of occupations, as distinguished from industries, is a difficult task; because the preparation of two distinct classifications for occupations and industries is an undertaking whose need has only recently been realised. It is, however, of some interest to examine the trends in the broad occupational groups in the United States since 1870, which have been tabulated on a comparable basis by various investigators, and also to compare them with the comparable classification for England and Wales in 1931. This latter involves extensive rearrangement of Census groupings, as the English definition of "semi-skilled" and other categories differs widely from the American.

The rapid decrease in the relative number of farmers

TABLE I

Socio-Economic Grouping of U.S. Labour Force 1870–1950 and England and Wales 1931

Percentage Distribution

	England and Wales Census Report	Annual Report on Labour Force	Dr. Edwards, Comparative Occupation Statistics (1940 Census Report)				Sogge, *Journal of the American Statistical Society*, December 1944				
	1931	1950	1940	1930	1920	1910	1910	1900	1890	1880	1870
Professional	4·4	7·2	6·5	6·1	5·0	4·4	5·4	5·4	4·9	3·8	3·3
Farmers	1·9	7·0	10·2	12·4	15·5	16·4	16·3	19·8	23·6	24·6	24·0
Other proprietors, managers and officials	7·5	10·4	7·6	7·5	6·7	6·6	..	..	..	..	..
Clerks	13·9	12·7	17·2	16·3	13·8	10·2	..	..	..	..	..
Salesmen		6·3									
Skilled and foremen	16·4	12·9	11·7	12·9	13·5	11·7	..	..	..	..	..
Semi-skilled	22·4	20·8	21·0	16·4	16·1	14·7	..	..	..	..	..
Unskilled, not farm	19·6	6·3	10·7	12·9	14·6	14·6	..	..	..	..	..
Farm workers	5·1	5·1	7·1	8·6	9·4	14·5	16·1	15·2	13·2	19·1	23·1
Domestics	10·0	3·2	8·0	6·9	5·4	6·8	..	..	..	..	..
Other personal service workers		8·0									

is the outstanding feature. "Other proprietors, managers and officials" show an upward trend; but only during the last decade has it been enough to counterbalance the loss of farmers. There is an upward trend in the number of professional men and women, but only very gradual. (Incidentally, it is not always realised that, in nearly every country, the number of professional women greatly exceeds the number of professional men, if the teaching and nursing professions be taken into account.) It is sometimes claimed that modern mechanisation is destroying the demand for skilled labour, but in fact the proportion of skilled manual workers has increased slightly since 1910. There has been a much greater increase in the number of semi-skilled, but this is more than offset by the decrease in the number of completely unskilled. It is this latter class who are put out of work to the greatest extent by mechanical advance, not the skilled men.

The interesting feature about the English comparison is the greater number of skilled men on the one hand and of completely unskilled on the other. The number of semi-skilled is also relatively higher than in the United States, though it would be about the same if we allowed for the lower relative importance of agriculture in England. The proportion of professional men and women is lower in England and of domestic and other personal service workers was higher (though by 1951 the English proportion was probably below the American).

The changes in the relative numbers engaged in the different occupations must depend partly on the changes in the relative importance of different industries, and secondly upon changes of the occupational structure within individual industries. A full examination of this topic has not yet been undertaken. The following table, however, compiled from the U.S. Census of 1940, gives quite an interesting idea of the occupational structure of the principal industrial groups, and has been used to estimate the probably occupational structure of the economy in the future, on various assumptions about the probable changes in the relative importance of different industrial groups.

TABLE II

Working Population of Major Industry Groups (Sex and Occupational Distribution per 1000)

U.S.A. 1940

	Industry Groups															
	Mining		Construction		Manufacture (including Gas and Electricity)		Transport and Communication (including Post Office)		Commerce, Finance, Business and Repair Service		Personal Service (including Restaurants, excluding Private Domestic Service)		Professional Service (including Teaching)		Government (excluding Post Office, Teaching, Defence)	
Occasional Classes	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Professional and semi-professional	19	..	31	..	29	3	17	1	16	2	44	13	298	398	97	40
Proprietors, managers and officials	34	..	56	1	43	2	72	8	219	28	112	32	12	5	133	15
Clerical, sales and kindred workers	29	9	15	12	97	50	191	96	260	180	30	36	25	85	138	191
Craftsmen, foremen and kindred workers	131	..	586	3	191	5	147	1	95	3	33	2	13	1	37	1
Operatives and kindred workers	767	2	76	..	280	146	295	2	113	14	60	80	16	7	33	2
Personal service workers	7	..	4	..	15	1	37	3	29	10	277	265	72	61	254	13
Labourers	2	..	215	1	131	7	129	1	32	1	14	2	7	..	46	..
Total	989	11	983	17	786	214	888	112	762	238	570	430	443	557	738	262

Industries omitted :- Agriculture, forestry and fishing. Defence. Private Domestic Service.

TABLE III

INDUSTRIAL DISTRIBUTION OF LABOUR FORCE *and Employers and Workers on Own Account as Percentage of Whole*

Country and Year	Labour Force (excl. Women in Agriculture), millions	Percentage Distribution of Labour Force (excluding those whose industry unknown): Agriculture, Fishing and Forestry	Mining	Construction	Manufacture, Electricity and Gas	Transport and Communications	Commerce and Finance	Professions and Entertainment	Forces	Other Government Services	Private Domestic Service	Other Services	Notes
Algeria, 1948	2·42	74·6	0·7	2·5	6·5	2·7	7·1	← 5·8 →					
Argentine, 1947	6·36	25·7	0·5	← 30·0 →		6·5	14·3	← 23·0 →					
1947	*22*	*32*	*3*	*20*		*13*	*41*	*10*					
1914	3·16	23·6	0·1	← 37·5 →		4·9	13·1	6·1	0·4	4·6	← 9·7 →		
Australia, 1947	3·18	16·8	1 8	7·8	28·0	10·0	16·1	7·2	1·3	4·3	← 6·5 →		Excl. unemployed
1947	*19*	*58*	*7*	*13*	*8*	*11*	*20*	..	..	..	..	..	
1939	2·75	20·5	2·6	6·6	25·2	8·4	17·6	8·1	0·5	1·5	4·7	4·3	Do.
1933	2·17	24·7	2·3	6·9	19·1	8·8	18·2	8·4	0·3	1·7	5·0	4·6	Do.
1933	*25*	*52*	..	*14*	*14*	*12*	*25*	*14*	..	..	..	*35*	
1921	2·29	23·0	2·9	10.1	21·4	9·2	14·5	8·5	0·4	0·8	4·7	4·5	
1911	1·93	24·8	5·5	9·1	19·7	8·1	14·5	7·3	0·3	0·7	6·0	4·3	
1901	1·60	25·4	7·4	10·1	16·8	7·2	13·2	6·9	0·4	0·5	6·9	5·2	
1891	1·34	26·5	5·7	13·0	17·6	6·7	11·2	← 7·5 →			← 11·8 →		
1881	0·91	← 38·6 →		← 29·8 →		4·5	9·3	← 17·8 →					
1871	0·68	← 43·9 →		← 26·5 →		3·8	8·1	← 17·7 →					
Austria, 1951	2·78	18·7	1·4	8·9	35·2	6·4	9·5	← 19·8 →					
1951	*18*	*45*	*0*	*6*	*12*	*5*	*28*	..	..	..	..	..	
1934	2·84	24·5	0·8	← 37·8 →		5·3	9·6	5·3	← 4·0 →		← 12·3 →		
1934	*20*	*29*	..	*16*		*6*	*34*	..	..	..	..	..	
1920	2·74	23·3	← 37·4 →			← 13·7 →		2·9	← 9·9 →		← 12·7 →		
1910	10·66	40·5	4·1	← 30·8 →		3·8	8·9	1·7	2·4	3·3	← 4·5 →		
1900	10·46	39·0	← 30·0 →			← 9·9 →		← 21·1 →					
1900	*30*	*26*	*19*			*36*		..	..	..	..		
1890	9·72	42·9	← 29·6 →			← 8·7 →		← 5·1 →			← 13·7 →		
1890	*27*	*24*	*21*			*37*			..	..	..	..	
1880	9·4	49·7	← 28·3 →			← 5·6 →		← 5·3 →			← 11·1 →		
1869	6·5	47·5	← 27·9 →			← 7·4 →		← 17·2 →					
1869	..	*25*	*18*			*40*		..	..	..	..	..	
Belgium, 1947	3·42	10·9	5·7	5·9	39·5	7·3	14·1	9·4	1·0	..	← 6·2 →		Professions include public service
1947	*22*	*59*	*1*	*24*	*13*	*8*	*46*	..	..	..	*33*		
1930	3·61	13·6	6·1	← 43·0 →		7·0	14·9	3·8	2·0	4·6	← 5·0 →		

1930	..	*42*	← *11* →			*8*	*50*	*29*	..	..	..	..	
1920	3·07	16·0	7·1	← 42·4 →		8·1	11·4	3·9	2·3	3·5	← 5·3 →		
1910	3·28	17·6	6·2	← 43·9 →		6·0	12·8	3·7	1·2	2·2	← 6·4 →		
1900	3·13	16·7	← 43·9 →			← 12·3 →		← 27·1 →					
1890	..	18·2	← 40·5 →			← 12·3 →		← 27·3 →					
1880	2·48	24·5	← 38·7 →			← 9·9 →		← 6·7 →		← 20·2 →			
Brazil, 1950	16·38	56·0	3·0	← 13·7 →		4·3	6·6	..	1·5	← 15·0 →			Last figure includes professions
1940	13·05	67·9	0·1	← 9·9 →		4·2	4·8	← 13·1 →					
Bulgaria, 1934	2·04	69·1	0·4	← 13·6 →		2·3	4·1	2·1	← 3·9 →		← 4·4 →		
1934	*45*	*52*	..	*27*		*26*	*52*	..	..	..	..	..	
1920	1·49	69·7	0·4	← 13·8 →		2·3	4·7	3·0	2·8	2·0	← 1·3 →		
1910	1·33	70·4	0·1	← 13·6 →		2·1	5·2	2·7	2·7	1·5	← 1·7 →		
Burma, 1931	..	69·0	1·0	← 13·0 →		← 14·0 →		← 3·0 →					
Canada, 1951	5·26	18·7	2·0	6·6	27·4	7·8	16·5	← 20·8 →					
1951	*20*	*61*	*2*	*18*	*5*	*9*	*16*	..	..	..	..	..	
1941	4·51	29·2	2·3	5·4	24·1	6·5	14·0	6·6	..	3·4	← 8·5 →		Government includes Forces
1941	*25*	*53*	..	*16*	*6*	*7*	*24*	*14*	..	..	..	*35*	
1931	3·93	32·6	1·9	6·8	19·5	8·2	12·9	6·9	..	3·1	← 8·1 →		Do.
1931	*26*	*55*	..	*15*	*7*	*7*	*21*	*17*	..	..	..	*38*	
1911	2·72	40·0	2·4	10·1	14·1	9·1	10·9	4·0	..	1·5	← 7·9 →		Do.
1901	1·80	43·6	2·4	11·7	13·7	4·8	9·4	4·4	..	1·0	← 9·3 →		Do.
Ceylon, 1946	2·26	43·9	0·4	1·4	11·3	← 25·1 →		3·7	1·1	2·0	4·8	6·3	
1921	..	54·0	← 15·7 →			← 14·5 →		← 15·7 →					
Chile, 1940	1·70	34·1	5·7	3·4	17·5	4·4	9·6	← 13·0 →			8·9	3·5	
1940	*25*	*25*	*2*	*9*	*30*	*13*	*60*	*21*			*0*	*49*	
1930	1·34	37·8	5·8	← 22·1 →		5·2	11·1	2·0	1·6	3·7	7·2	3·4	
1930	*26*	*30*	*2*	*31*		*13*	*49*	..	..	..	..	..	
1920	1·34	38·9	4·4	← 25·7 →		5·1	9·4	2·9	1·2	1·9	← 10·5 →		
Colombia, 1938	3·00	60·6	2·6	3·0	15·2	2·2	5·5	0·7	← 2·7 →		4·8	2·6	
1938	*45*	*50*	*33*	*5*	*57*	*17*	*77*	*61*	*0*		*0*	*53*	
Cuba, 1943	1·51	51·6	0·5	2·2	15·9	2·8	12·5	2·9	← 4·8 →		← 6·6 →		
1943	*43*	*64*	*20*	*34*	*34*	*14*	*43*	*25*	..	..	..	..	
1919	0·94	48·1	0·1	← 20·2 →		← 15·7 →		2·4	1·8	1·2	← 10·4 →		
Cyprus, 1946	0·16	46·5	..	5·1	30·5	5·5	6·0	← 6·3 →					
1946	*41*	*70*	..	*7*	*35*	*32*	*76*	..	..	..	..	..	
Czechoslovakia, 1947	4·77	23·6	3·0	← 43·0 →		6·0	7·9	← 13·0 →			← 3·4 →		
1947	*22*	*57*	*1*	*11*		*5*	*28*	..	..	..	..	..	

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TABLE III (*contd.*)

INDUSTRIAL DISTRIBUTION OF LABOUR FORCE *and Employers and Workers on Own Account as Percentage of Whole*

Country and Year	Labour Force (excl. Women in Agriculture), millions	Percentage Distribution of Labour Force (excluding those whose industry unknown): Agriculture, Fishing and Forestry	Mining	Construction	Manufacture, Electricity and Gas	Transport and Communications	Commerce and Finance	Professions and Entertainment	Forces	Other Government Services	Private Domestic Service	Other Services	Notes
Czechoslovakia, 1930	5·90	27·3	2·2	← 41·4 →		5·0	9·9	← 8·8 →			← 5·4 →		
1930	*23*	*47*	..	*12*		*5*	*37*	..	..	..	..	..	
1921	5·26	32·3	3·1	← 39·7 →		4·7	7·0	3·2	2·7	2·2	← 5·1 →		Agric. pop. in 1910 was about 4 per cent higher than that of the same area in 1921
1921	*28*	*49*	..	*13*		*6*	*36*	..	..	..	..	..	
Denmark, 1952	2·01	19·0	0	7·2	31·2	6·7	14·7	← 21·1 →					
1940	1·85	23·6	0	6·3	26·2	6·2	13·1	7·8	← 1·6 →		← 9·3 →		
1940	*21*	*46*	..	*18*	*12*	*12*	*26*	..	..	..	..	..	
1930	1·47	30·6	0	← 30·1 →		6·3	10·8	5·4	← 1·2 →		← 15·6 →		
1930	*30*	*38*	..	*23*		*24*	*34*	..	..	..	..	..	
1921	1·29	31·7	0	← 28·8 →		6·3	11·5	5·9	0·7	0·9	← 14·2 →		
1911	1·12	37·3	0	← 27·6 →		4·8	11·9	4·5	0·8	1·4	← 11·7 →		
1901	1·00	42·4	0	← 27·6 →		← 13·1 →		← 16·9 →					
1834	..	..	..	21		..	..	..	..	..	..	..	Warming, *Weltwirtschaftliches Archiv*, May 1936
Dominican Republic, 1920	0·20	73·0	← 12·0 →			1·1	6·1	1·2	← 2·1 →		← 4·5 →		
Egypt, 1947	5·98	61·1	0·2	1·9	11·8	3·4	10·4	← 8·6 →			← 2·6 →		
1937	5·39	66·9	0·2	2·2	8·9	2·6	8·5	← 6·0 →			← 4·7 →		
1937	..	*38*	*6*	*24*	*41*	*34*	*67*	..	..	..	..	..	
1917	4·22	64·1	0·1	← 12·9 →		4·0	7·4	3·8	1·2	1·1	← 5·4 →		
1907	3·43	70·3	0·1	← 11·3 →		3·1	4·9	4·9	1·7	0·9	← 2·8 →		
El Salvador, 1930	..	73·0	..	← 5·1 →		..	..	..	..	..	..	..	
Estonia, 1934	0·44	51·7	0·7	← 23·6 →		3·9	7·1	← 9·2 →			← 3·8 →		
1934	*35*	*50*	..	*29*		*14*	*37*	..	..	..	..	..	
1922	0·41	53·4	0·7	22·0		4·2	5·7	3·5	3·3	3·1	← 4·1 →		
Finland, 1950	1·62	34·2	0·4	7·7	26·5	6·7	10·1	..	..	..	..	..	
1950	*22*	*46*	*2*	*8*	*12*	*13*	*13*	..	..	..	..	..	

1940 . .	1·49	46·8	0·2	3·3	24·4	5·3	6·7	4·3	1·0	1·5	3·0	3·5	
1930 . .	1·24	57·0	0·1	2·6	19·9	4·7	5·8	4·1	0·2	1·3	← 4·3 →		
1920 . .	1·07	62·9	0·1	← 20·0 →		4·2	5·2	2·6	0·3	1·6	← 3·1 →		
1910 . .	0·97	69·8	0	← 16·8 →		3·5	3·3	1·9	0·1	1·1	← 3·5 →		
France, 1951 . .	17·44	20·2	← 41·4 →			6·0	16·4	← 10·8 →			← 5·2 →		*Bulletin de la Statistique Générale*, Oct. 1951
1946 . .	17·26	25·6	2·3	6·0	28·1	7·1	14·7	← 18·0 →					
1946 . .	*32*	*49*	*3*	*23*	*17*	*9*	*52*	..	..	..	..	..	
1936 . .	17·34	24·7	2·0	4·3	29·8	6·0	15·6	4·2	← 8·3 →		← 5·1 →		"Professions" include State school teachers
1936 . .	*36*	*66*	*3*	*26*	*26*	*6*	*49*	*32*	..	..	..	..	
1931 . .	18·4	24·5	← 41·0 →			5·0	14·2	5·0	2·2	3·3	← 4·8 →		Do.
1931 . .	*35*	*65*	*23*			..	*47*	*35*	..	..	..	..	
1926 . .	18·00	26·7	2·4	← 37·0 →		5·7	13·6	4·3	2·0	3·5	← 4·7 →		Do.
1921 . .	17·76	28·5	1·8	← 34·8 →		7·5	12·7	4·3	2·4	3·2	← 4·8 →		Do.
1911 . .	17·69	30·1	1·4	← 37·8 →		4·1	11·6	4·6	3·5	1·7	← 5·3 →		Do.
1901 . .	16·4	33·1	← 42·0 →			← 11·4 →		2·8	1·7	3·2	← 5·8 →		Do.
1866 . .	15·1	43	← 38 →			← 8 →		← 11 →					
1866 . .	..	..	*40*			*17*	*68*	..	..	..	..	..	
1827 . .	12·8	63	..	..	..	..	..	..	..	..	..	..	Dupin's estimate
Germany, 1950 . .	20·28	11·8	← 49·0 →			← 18·8 →		← 20·3 →					Federal Republic and W. Berlin
1950 . .	*15*	*45*	*10*			*11*		..	..	..	..	..	
1946 . .	6·81	15·4	4·0	6·8	39·4	6·1	9·4	← 18·8 →					Soviet Zone
1946 . .	*17*	*42*	*2*	*11*	*13*	*6*	*26*	..	..	..	..	..	
1939 . .	35·2	14·0	2·3	← 44·8 →		← 19·4 →		..	3·7	..	4·3	..	Includes Austria and Sudetenland. Services not specified occupied 11·5 per cent
1939 . .	*16*	*43*	..	..	*10*	..	..	..	..	..	..	..	
1933 . .	31·0	18·1	← 46·5 →			← 21·0 →		..	..	..	4·7	..	Includes Austria. Services not specified occupied 9·7 per cent
1933 . .	27·9	16·9	2·7	7·2	37·5	5·6	13·0	4·2	0·5	3·5	4·6	4·3	Excludes Austria

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TABLE III (*contd.*)

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Country and Year	Labour Force (excl. Women in Agriculture), millions	Percentage Distribution of Labour Force (excluding those whose industry unknown)											Notes
		Agriculture, Fishing and Forestry	Mining	Construction	Manufacture, Electricity and Gas	Transport and Communications	Commerce and Finance	Professions and Entertainment	Forces	Other Government Services	Private Domestic Service	Other Services	
Germany, *1933* . .	*18*	*37*	..	*11*	*13*	*4*	*28*	*16*	...	...	...	*26*	
1925 . .	27·05	17·8	3·1	6·3	39·5	5·6	11·4	4·2	0·5	2·4	5·2	4·0	
1925 . .	*18*	*36*	..	*14*	*14*	*4*	*31*	*19*	..	..	..	*29*	
1907 . .	22·22	23·8	4·3	8·6	37·7	3·6	8·1	..	..	..	6·6	..	Services not specified occupied 7·3 per cent
1907 . .	*25*	*35*	..	*11*	*19*	*9*	*38*	..	..	..	..	..	
1882 . .	9·78	35·5		← 37·4 →		← 9·3 →		..	..	..	9·1	..	Prussia only
Great Britain, 1951 .	22·46	4·5	3·9	6·3	39·5	7·8	14·2	7·0	3·4	4·6	2·3	6·8	
1951 .	*7*	*33*	*0*	*9*	*2*	*3*	*16*	..	..	..	..	..	
1931 .	21·00	65·7	6·1	5·4	35·0	8·0	16·0	4·1	1·2	5·4	7·8	4·9	
1931 .	*12*	*30*	*1*	*6*	*7*	*6*	*26*	*22*	..	..	..	*30*	
1921 .	19·37	6·7	7·3	4·1	38·7	8·1	13·2	3·7	1·6	4·8	7·0	4·5	
1911 .	18·22	7·8	6·9	5·2	34·6	8·0	← 18·7 →		← 4·2 →		9·0	5·6	
1901 .	15·39	8·7	5·9	8·0	32·9	9·3	11·0	4·4	1·1	1·4	14·3	2·0	
1891 .	14·05	10·4	4·5	6·3	38·6	7·5	10·3	5·0	0·9	1·1	← 15·4 →		
1881 .	12·80	12·3	4·1	6·7	39·5	5·9	9·2	3·8	1·0	0·9	← 16·6 →		
1871 .	11·8	15·0	3·8	6·2	39·8	5·2	8·3	3·4	1·2	0·8	← 16·6 →		From Booth's data for England and Wales only (*J.R.S.S.*, 1886, p.314) estimated for Great Britain
1861 .	10·6	19·0	3·7	5·5	39·8	4·8	7·1	3·2	1·3	0·8	← 15·2 →		
1851 .	9·4	22·2	3·3	5·4	40·1	4·4	6·3	3·1	1·0	0·6	← 14·0 →		Do.
1841 .	6·7	23·1	3·1	5·8	36·6	3·0	5·7	2·9	0·7	0·4	← 19·1 →		
Greece, 1928 . .	2·28	51·8	0·3	← 22·0 →		5·5	10·7	4·4	1·1	1 2	← 3·0 →		
1920 . .	1·76	53·9	0·6	← 19·4 →		5·2	10·0	4·9	1·8	1·4	← 2·8 →		
Guatemala, 1940 . .	1·04	78·0	0·0	← 13·9 →		0·5	3·3		← 0·3 →		← 4·0 →		
Honduras, 1940 . .	...	72·5	0·6	← 9·2 →					← 6·2 →				
Hungary, 1930 . .	3·36	48·1	1·1	← 27·4 →		3·5	7·0		← 7·3 →		← 5·5 →		
1930 . .	*28*	*37*	*0*	*25*		*8*	*37*	..	..	..	..	..	

1920 . .	3·02	51·1	1·4	← 23·2 →		4·0	6·3	← 8·7 →			← 5·3 →		
1910 . .	2·65	45·4	1·2	← 27·9 →		4·1	6·2	← 7·4 →			← 7·9 →		Post-1919 territory
1900 . .	7·1	61·0	← 18·2 →			← 5·6 →		← 18·8 →					
Iceland, 1940 . .	0·050	41·4	0·2	5·8	18·3	8·2	8·1	← 17·6 →					
1940 . .	*20*	*35*	*0*	*10*	*12*	*6*	*18*	..	..	..	..	..	
1930 . .	0·044	53·5	0·0	← 14·8 →		7·3	8·0	← 4·6 →			← 11·6 →		
India, 1951 . .	..	69·4	← 10·7 →			1·6	6·1	← 12·2 →					Earners and dependants
1951 . .	..	*82*	..	..	..	..	..	..	..	..	..	..	
1931 . .	117·6	69·5	0·3	← 14·3 →		2·2	7·3	0·9	0·3	1·4	← 3·7 →		Ghate, *Changes in the Occupational Distribution of the Population*, Office of the Govt. Econ. Adviser, 1940
1921 . .	112·4	69·7	0·3	← 15·2 →		2·0	7·8	0·7	0·4	1·5	← 2·4 →		Do.
1911 . .	114·5	68·2	0·3	← 16·5 →		2·3	7·7	0·5	0·3	1·6	← 2·6 →		Do.
1901 . .	108·4	64·2	0·3	0·7	21·2	1·6	1·6	2·1	0·3	1·8	← 5·7 →		"Manufacture" here apparently includes many who would have been classified under Commerce in later years
1881 . .	97·0	50·7	← 34·7 →			← 3·8 →		← 3·4 →			← 7·1 →		Do.
Indonesia, 1930 : Java .	12·47	65·4	0	← 15·4 →		2·0	9·4	1·1	← 3·6 →		← 2·6 →		
Rest	5·05	77·7	0	← 10·5 →		1·9	5·3	1·0	← 2·5 →		← 1·0 →		
Ireland, 1946 . .	1·22	41·5	1·4	5·3	14·4	4·3	11·3	← 21·8 →					Excluding Northern Ireland
1946 . .	*25*	*42*	*9*	*8*	*16*	*5*	*25*	..	..	..	..	..	
1936 . .	1·23	49·6	← 16·2 →			4·1	10·4	← 9·5 →			← 9·9 →		Do.
1936 . .	*29*	*43*	...	*12*	*13*	*13*	*27*	..	..	..	..	..	
1926 . .	1·22	53·4	← 12·9 →			3·2	9·3	← 10·5 →			← 10·5 →		Do.
1926 . .	1·69	48·0	← 19·3 →			← 16·8 →		← 6·8 →			← 9·1 →		All Ireland
1911 . .	1·82	43·0	← 28·9 →			3·5	6·8	← 7·8 →			← 10·0 →		
1901 . .	1·96	44·5	← 27·9 →			3·0	6·1	← 6·7 →			← 11·8 →		
1881 . .	2·24	44·2	← 30·2 →			← 7·4 →		← 5·3 →			← 13·0 →		
1871 . .	2·57	41·1	← 32·7 →			← 6·7 →		← 4·3 →			← 15·2 →		
1861 . .	2·73	43·2	← 33·9 →			← 5·9 →		← 3·7 →			← 13·3 →		
1851 . .	3·02	47·3	← 34·1 →			← 5·0 →		← 3·3 →			← 10·3 →		

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Ireland, 1841	3·62	50·8	← 34·5 →			← 3·1 →		← 2·2 →			← 9·4 →		
Italy, 1951	18·2	34·9	← 40·2 →				11·6	← 8·0 →			← 5·6 →		
1936	15·9	40·3	0·8	6·2	25·5	4·4	8·3	3·5	1·2	2·7	4·2	2·9	
1936	*29*	*40*	*4*	*10*	*21*	*22*	*47*	*42*	..	..	..	..	
1931	15·7	41·7	0·8	← 31·8 →		4·9	7·3	..	0·9	..	..	3·4	
1921	15·2	46·5	0·7	← 28·3 →		4·7	6·3	..	2·4	..	..	2·9	
1911	13·4	45·4	0·8	← 31·2 →		3·9	5·6	..	1·9	..	..	3·6	
1901	13·0	48·9	0·6	← 29·3 →		← 8·2 →		..	..	..	..	..	
1881	11·9	45·8	0·5	← 35·7 →		2·6	2·0	..	..	..	..	..	
1871	..	51·0	0·4	← 31·9 →		2·3	2·0	..	..	..	..	..	
Japan, 1950	27·8	32·6	2·0	5·3	← 27·3 →		15·5	← 17·3 →					
1950	*30*	*55*	*2*	*22*	*11*		*38*	..	..	..	..	..	
1940	25·3	28·6	2·4	← 32·4 →		5·5	19·5	← 8·8 →			← 2·8 →		
1930	23·0	36·2	1·4	← 25·6 →		4·1	21·4	← 7·7 →			← 3·5 →		
1930	*41*	*60*	..	*28*		*16*	*49*	..	..	..	..	..	
1920	20·6	41·3	2·1	← 26·4 →		5·1	15·9	← 5·9 →			← 3·3 →		
1912	19·5	48·0	1·8	← 23·0 →		3·8	14·2	← 9·0 →					
1897	16·9	59·4	0·7	← 17·6 →		2·0	11·9	← 8·0 →					
1887	14·65	67·0	0·3	← 13·5 →		1·2	10·3	← 7·4 →					
1872	10·97	76·4	0	← 7·5 →		1·1	8·6	← 6·2 →					
Latvia, 1935	0·78	50·5	← 22·7 →			3·4	8·9	5·2	← 5·1 →		← 4·2 →		
1935	*35*	*47*	*30*			*18*	*39*	..	..	..	..	..	
1925	0·73	54·9	0·5	← 18·2 →		5·0	8·1	4·0	2·8	2·2	← 4·3 →		
Lithuania, 1923	0·80	67·4	0	← 11·1 →		1·7	4·3	1·7	3·0	1·1	← 9·7 →		
1923	*38*	*42*	..	*29*		*11*	*51*	..	..	..	..	..	
Luxembourg, 1947	0·120	17·2	← 44·5 →			← 21·2 →		← 11·8 →			← 5·2 →		
1947	*21*	*46*	*13*			*26*		..	..	..	..	..	
Malaya and Singapore, 1947	2·09	50·1	2·3	0·5	11·2	6·6	13·1	← 16·0 →					
1931	1·65	52·6	← 14·5 →			← 20·6 →		← 3·6 →			← 7·9 →		
Mexico, 1940	5·82	67·0	1·9	1·9	9·4	2·6	9·8	0·8	← 3·4 →		← 3·2 →		
1930	5·33	70·2	1·0	1·2	12·3	2·1	5·3	1·0	← 3·0 →		← 3·6 →		

1921 . .	5·50	71·3	0·6	← 13·1 →		1·5	5·6	1·7	1·0	0·3	← 5·0 →		
Netherlands, 1947 .	3·54	16·8	1·5	7·9	28·0	7·0	15·9	3·5	← 6·0 →		5·3	7·1	Excludes 158,000 in Armed Forces (non-permanent)
1947 .	*20*	*41*	*2*	*20*	*11*	*14*	*32*	..	..	..	..	..	
1930 .	3·08	18·0	1·7	← 38·9 →		9·7	14·7	← 9·0 →			← 8·0 →		
1930 .	*20*	*39*	..	*14*		*20*	*39*	..	..	..	..	..	
1920 .	2·63	21·1	1·8	← 37·8 →		10·0	12·2	6·7	0·7	1·2	← 8·5 →		
1909 .	2·15	24·7	1·0	← 36·1 →		9·0	11·4	← 7·1 →			← 10·0 →		
1899 .	1·84	28·5	← 35·9 →			← 18·3 →		2·7	← 3·7 →		← 10·9 →		
1899 .	..	*28*	..	*25*		*45*		..	..	..	..	..	
New Zealand, 1945 .	0·579	20·1	1·3	7·3	23·6	12·3	16·8	11·1	..	1·9	← 5·6 →		Excludes 89,000 in the Forces
1945 .	*19*	*54*	*4*	*18*	*7*	*6*	*16*	..	..	..	..	..	
1936 .	0·616	25·2	1·8	7·5	19·3	10·1	16·2	8·3	0·3	1·8	← 9·2 →		
1936 .	*20*	*41*	← *12* →			*9*	*20*	..	..	..	..	..	
1926 .	0·521	24·1	1·6	8·3	18·9	11·3	16·1	8·6	0·4	2·2	← 8·5 →		
1921 .	0·499	27·3	1·6	6·6	18·9	11·1	15·8	8·2	0·3	1·9	← 8·3 →		
1916 .	0·434	27·9	2·2	6·2	19·6	9·8	15·7	7·3	0·9	1·1	← 9·3 →		
1911 .	0·429	27·2	2·9	8·6	19·8	8·7	15·8	6·3	0·1	0·8	← 9·8 →		
1906 .	0·374	28·9	4·3	8·5	19·2	7·9	14·4	5·6	0·1	1·0	← 10·1 →		
1901 .	0·318	29·6	5·6	7·2	20·3	6·8	12·7	5·7	0·3	1·0	← 10·8 →		
1896 .	0·286	30·5	6·5	5·4	23·2	5·9	11·7	5·6	0·1	1·0	← 10·1 →		
1891 .	0·245	30·1	6·9	5·1	23·6	6·3	11·3	5·5	0·1	0·9	← 10·2 →		
1886 .	0·221	32·1	6·2	5·9	25·4	6·8	6·5	4·3	0·2	1·6	← 11·0 →		
1881 .	0·188	31·9	8·4	6·4	23·1	6·7	5·7	4·0	0·4	1·7	← 11·7 →		
1878 .	0·140	35·2	10·0	7·1	24·9	7·7	5·6	3·9	0·4	1·8	← 3·4 →		
1874 .	0.123	30·5	13·9	5·6	21·5	7·3	4·5	3·1	0·8	1·9	← 11·0 →		
1861 .	0·042	23·5	34·5	← 18·2 →			10·3	..	..	..	← 8·8 →		
Norway, 1950 . .	1·37	24·6	0·7	9·5	27·2	10·4	11·2	← 16·6 →					
1950 . .	*24*	*60*	*2*	*18*	*12*	*10*	*21*	..	..	..	..	..	
1930 . .	1·13	34·0	1·1	3·7	23·3	9·8	11·6	4·6	0·3	1·1	← 10·4 →		
1930 . .	*27*	*52*	*2*	*23*	*17*	*9*	*29*	..	..	..	..	..	
1920 . .	0·991	34·1	1·6	← 29·8 →		9·3	10·1	3·7	0·4	1·4	← 9·6 →		
1910 . .	0·835	37·5	0·9	← 28·6 →		9·0	8·5	3·2	0·6	1·1	← 10·6 →		
1900 . .	0·788	37·1	← 31·6 →			8·9	7·7	← 4·6 →			← 10·2 →		
1890 . .	0·675	45·2	← 26·7 →			8·6	6·0	← 4·0 →			← 9·5 →		
1875 . .	0·620	48·8	← 24·1 →			9·3	4·4	← 2·9 →			← 10·5 →		
Pakistan, 1951 . .	21·5	70·0	..	..	..	..	..	..	..	..	..	..	
Peru, 1940 . . .	1·99	54·3	2·3	2·3	19·0	2·6	5·8	..	← 4·6 →		..	..	
1940 . . .	*46*	*53*	*7*	*6*	*61*	*6*	*61*	..	..	..	..	..	

[*contd. overleaf*

TABLE III (*contd.*)

INDUSTRIAL DISTRIBUTION OF LABOUR FORCE *and Employers and Workers on Own Account as Percentage of Whole*

Country and Year	Labour Force (excl. Women in Agriculture), millions	Percentage Distribution of Labour Force (excluding those whose industry unknown)											Notes
		Agriculture, Fishing and Forestry	Mining	Construction	Manufacture, Electricity and Gas	Transport and Communications	Commerce and Finance	Professions and Entertainment	Forces	Other Government Services	Private Domestic Service	Other Services	
Philippines, 1948	5·37	60·1	0·4	2·8	9·6	2·9	7·2	3·6	← 5·5 →		← 8·0 →		
1948	*39*	*61*	*0*	*2*	*45*	*7*	*57*	*10*	..	..	..	..	
1939	4·78	66·9	1·0	← 12·7 →		4·2	5·7	2·1	← 1·1 →		← 5·5 →		
Poland, 1931	10·7	51·3	1·7	← 22·3 →		3·2	7·7	3·1	← 2·8 →		← 3·9 →		
1931	*37*	*51*	*0*	*28*		*14*	*53*	*24*	..	..	..	..	
1921	8·40	63·4	1·1	← 14·5 →		3·0	6·4	2·6	4·3	1·4	← 3·4 →		
Portugal, 1940	2·82	47·5	0·8	5·3	17·6	3·3	7·2	← 6·4 →			← 11·8 →		
1940	*22*	*32*	*4*	*4*	*14*	*8*	*36*	..	..	..	..	..	
1930	2·42	55·9	0·3	← 21·5 →		3·0	6·1	1·6	1·5	0·6	← 7·8 →		
1930	*33*	*32*	...	*20*	*25*	*10*	*45*	*29*	..	..	..	..	
1911	2·21	50·9	0·4	← 24·8 →		3·5	7·0	1·9	1·7	0·7	← 9·0 →		
1890	2·11	56·1	0·2	← 23·3 →		2·7	5·3	1·5	2·1	0·9	← 7·6 →		
Puerto Rico, 1950	5·90	37·8	0·3	5·5	16·8	5·7	13·0	← 20·4 →					
1950	*15*	*17*	*4*	*5*	*7*	*16*	*43*	..	..	..	..	..	
Roumania, 1930	6·36	68·5	← 12·8 →			3·0	5·7	1·8	← 8·2 →		..	..	
1913	2·40	66·7	0·4	← 13·0 →		3·0	4·5	2·1	3·7	1·8	← 4·8 →		
Spain, 1940	8·99	50·6	1·1	4·2	19·4	3·5	6·6	..	3·6	..	..	..	
1930	8·22	45·4	1·4	3·4	27·5	3·5	5·8	4·6	2·7	1·0	← 4·7 →		
1920	7·60	57·3	1·8	3·3	17·4	2·9	5·6	3·4	2·9	1·3	← 4·1 →		
1910	7·58	66·7	1·4	3·8	11·1	2·5	2·1	4·0	2·7	0·6	← 5·1 →		
1900	7·03	67·1	1·3	3·9	11·3	2·2	2·3	3·8	2·3	0·8	← 5·0 →		
1887	7·03	69·0	← 15·2 →			1·7	2·8	← 5·3 →			← 6·0 →		
Sweden, 1950	3·06	19·3	0·5	7·8	33·4	8·2	13·1	← 17·7 →					
1950	*19*	*54*	*0*	*11*	*8*	*10*	*20*	..	..	..	..	..	
1940	2·92	27·1	1·2	6·7	29·2	7·0	14·1	← 9·1 →			← 5·5 →		
1940	*21*	*45*	*4*	*15*	*12*	*10*	*22*	..	..	..	..	..	
1930	2·63	30·5	1·3	6·5	27·5	7·3	10·0	5·0	1·0	0·9	← 10·0 →		
1930	...	...	← *12* →			*17*	*30*	*20*	..	..	..	..	
1920	2·35	34·9	0·9	← 34·1 →		6·6	9·4	4·2	0·8	1·2	← 7·9 →		
1910	1·94	40·8	0·7	← 29·7 →		6·0	6·5	3·2	1·5	1·1	← 10·5 →		
1900	1·73	42·8	← 23·8 →			← 8·6 →		← 24·9 →					
1890	..	49·2	← 18·3 →			← 7·1 →		..	..	..	..	..	

1840 . .	..	62·5	← 6·7 →			..	..	..	..	..	..	..	Estimated from data in Montgomery, *Rise of Modern Industry in Sweden*
1750 . .	...	61·5	← 6·1 →			..	..	..	..	..	..	..	Do.
Switzerland, 1941 .	1·96	19·9	0·4	7·1	37·4	4·0	10·3	← 7·6 →			6·2	7·1	
1941 .	*21*	*46*	*6*	*14*	*14*	*5*	*25*	..	..	..	..	*23*	
1930 .	1·89	19·2	0·3	← 45·9 →		4·5	10·1	← 5·4 →			7·4	7·2	
1930 .	...	*46*	...	*11*	*12*	*4*	*22*	*28*	..	..	..	*17*	
1920 .	1·77	21·7	0·4	← 46·4 →		5·1	8·2	← 5·4 →			6·6	..	
1910 .	1·68	22·4	0·4	← 48·2 →		5·0	6·9	← 4·9 →			6·8	..	
1905 .	...	...	...	*15*	*14*	*5*	*25*	..	..	..	..	*22*	
1900 .	1·47	27·1	0·5	← 47·0 →		4·1	5·7	← 4·4 →			6·8	..	
1880 .	1·21	32·7	0·2	← 44·6 →		2·9	4·9	← 4·2 →			7·8	..	
Thailand, 1947 . .	5·19	75·5	0·1	0·2	3·9	1·3	13·9	← 5·4 →					
Turkey, 1950 . .	7·27	75·6	0·3	← 13·0 →		1·6	3·3	← 5·9 →			← 2·2 →		
1935 . .	4·82	70·2	0·4	← 13·2 →		2·5	4·5	← 8·2 →			← 1·0 →		
Union of South Africa, 1946 . .	4·47	41·0	11·8	3·6	9·2	4·9	5·9	← 23·5 →					
1921 . .	2·92	56·8	9·2	← 10·2 →		2·8	4·8	1·8	← 2·2 →		← 12·1 →		
United States, 1950 .	59·40	11·6	1·7	6·5	29·2	7·8	19·2	9·0	2·9	6·0	3·6	2·3	Education included with professions not government
1950 .	*16*	*64*	*4*	*17*	*4*	*4*	*18*	*19*	*0*	*0*	*0*	*45*	
1940 .	53·3	18·3	2·2	7·0	23·9	8·3	17·5	8·0	3·4		5·2	6·2	1870–1940 Fabricant, *Studies in Income and Wealth*, vol. xi. Public utility (1·1 per cent in 1940) included with transport
1940 .	*19*	*61*	*4*	*19*	*2*	*7*	*23*	*15*	..		..	..	Do.
1930 .	48·8	22·6	2·3	6·4	23·1	10·2	15·7	7·2	2·2		4·9	5·2	
1920 .	41·6	27·6	3·0	5·3	26·4	10·2	11·8	5·5	2·2		4·1	3·9	

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TABLE III (*contd.*)

Industrial Distribution of Labour Force *and Employers and Workers on Own Account as Percentage of Whole*

Country and Year	Labour Force (excl. Women in Agriculture), millions	Agriculture, Fishing and Forestry	Mining	Construction	Manufacture, Electricity and Gas	Transport and Communications	Commerce and Finance	Professions and Entertainment	Forces	Other Government Services	Private Domestic Service	Other Services	Notes
		Percentage Distribution of Labour Force (excluding those whose industry unknown)											
United States, 1910	36·7	32·0	2·9	6·4	22·8	8·8	10·8	4·6		1·5	6·0	4·2	
1900	29·1	38·0	2·6	6·0	22·0	7·3	9·6	4·0		1·0	6·0	3·4	
1890	23·7	43·1	2·0	6·1	20·2	6·5	8·4	3·6		0·8	6·4	2·7	
1880	17·4	50·5	1·8	4·8	18·4	5·0	7·1	3·0		0·8	6·3	2·1	
1870	12·9	50·8	1·6	5·9	17·6	5·0	6·5	2·6		0·8	7·4	2·0	
1860	10·5	59·9	1·6	← 18·5 →		← 7·5 →		← 12·5 →					
1850	7·70	64·5	1·2	← 16·5 →		← 5·5 →		← 12·3 →					
1840	5·42	68·5	..	..	..	..	..	..	..	..	..	..	
1830	3·93	70·6	..	..	..	..	..	..	..	..	..	..	
1820	2·88	72·0	..	..	..	..	..	..	..	..	..	..	
Venezuela, 1941	1·20	49·6	2·0	17·3		5·2	8·4	..	← 4·9 →		..	..	
Yugoslavia, 1931	4·63	70·8	0·6	1·5	12·3	2·2	3·4	2·2	2·1	2·0	1·8	1·1	
1921	3·83	74·8	← 13·4 →			← 5·4 →		← 6·4 →					
1900	0·38	53·7	← 17·3 →			← 12·0 →		← 17·0 →					Serbia only

CHAPTER X

RELATIVE INCOMES AND OTHER FACTORS CONTROLLING THE SUPPLY OF LABOUR TO DIFFERENT INDUSTRIES AND OCCUPATIONS

THE concept of relative incomes is one that should have some use, though like all useful concepts it should not be pushed too far.

A good deal of information is now available about the relative contribution of different "industries" to net (sometimes only to gross) national product. This information, however, is not of great value unless we also know the relative numbers engaged in the different sectors; and accurate and comprehensive man-power statistics are generally only available for Census years. So it is our task to select all occasions for which reliable statistics showing the percentage distribution of net incomes are available for the same (or nearly the same) year as a population Census. All the available data fulfilling these conditions are set out in Table I. "Relative incomes" are then computed by simple division. Thus mining in Canada produces 4 per cent of the net national produce and employs only 2 per cent of the labour force, so is given a relative income of 2. This method compares any one industry with all industries taken together, not with any one industry taken as standard. This point is of some importance. Suppose that in some country agricultural income per head remains, throughout a long period, precisely half of non-agricultural income per head; but that agriculture employs two-thirds of the labour force at the beginning of the period, and one-third at the end of it. Then "relative income" of agriculture, calculated in this way, will stand at 0·75 at the beginning of the period and 0·6 at the end of it.

In measuring the money incomes for different countries and different times it is important that we should include imputation (or full retail value on home-produced food on farms) calculated as in Chapter III. In the apportionment of incomes to different industries this must be added to agricultural income. For each country also we must deal with "home-produced" income, i.e. excluding any income from property held outside the borders of the country (or adding back any payments which have been made to property owners elsewhere who have taken part of the product of the country in question). Finally, we must exclude from current production that element which does not correspond to any current effort on the part of the labour force, namely, the net income from the rental of dwellings. In the statistics of most countries an imputed rental for owner-occupied dwellings is included. In some countries the legal restriction of rents has reduced this figure to a very low amount.

It is only possible to compile Table I for countries whose real income is above 100 I.U. per head, i.e. more or less the category of countries whose income can be measured in I.U. and does not have to be measured in O.U. For these lower-income countries this method would be unsatisfactory.

It must be borne in mind that these figures relate to relative money incomes within the different countries, and may be affected in many ways by national policies which set out to increase the net money receipts of one industry or to decrease those of another.

Subject to this qualification we may notice that the relative income of agriculture is by no means always so low as might be supposed. The relative income of agriculture stands highest in Australia and New Zealand, being 1·52 for both countries. (It should be noticed that in both cases a year was chosen for comparison other than 1950–51, the year of extraordinarily high wool prices. If this had been taken, the ratio would have been higher still.) In two other exporting countries, Argentine and Denmark, the ratio is also fairly high and it is also slightly

2·0	2·
8·0	2·
3·1	2·
)·5	1·
)·8	1·
)·9	1·
4·5	1·

bly too high.

above 1 in the Netherlands. In Britain the figure fell steadily from 1·43 in 1868 to 0·93 in 1930, but now has risen to 1·27. In Sweden we can see a steady decline from 1870 to 1939; the most recent figures will probably show a reversal. In the United States the figure now appears to be higher than at any time in the nineteenth century.

Mining, in a relatively undeveloped country, offers very high rewards in relation to the general level of income of the surrounding people, for example in Peru. It also offers very high relative rewards in Canada. But in most advanced countries its rewards are more normal. In Britain mining was abnormally depressed in 1930 and only earns average income now.

The greater part of the net income of construction is the earnings of the manual labour engaged therein. The relative level of these earnings varies greatly with the strength of trade-union organisation and the amount of unemployment.

In a country where a large proportion of the whole labour force is engaged in manufacture, relative income in manufacturing, by virtue of its definition, cannot differ greatly from the national average. In Sweden the figures for the relative income of manufacture are unusually high. The Canadian figures show a significant fall since 1920, while the United States figures show a significant rise since the same date. These curious movements deserve further examination.

For transport and communication the figure generally shows a tendency to fall as time goes on, and to be highest in relatively undeveloped countries. Large amounts of capital are involved whose earnings probably represent a larger proportion of the whole national product in the early stages of development, or in comparatively undeveloped countries.

The same trends are more marked in the case of commercial and financial incomes. It is not so much a question of the amount of capital involved, though this is sometimes considerable, as of the skill and training

necessary for the successful conduct of commerce and finance. Such skill is comparatively rare in an undeveloped country; but in more-developed countries it is very common, and commands little if any premium over other work. It is interesting to see how rapid has been the fall in the relative level of this figure in some countries such as Denmark and Finland. The Swedish figure going back to 1870 is more striking still.

In the United States, as recently as 1930, relative income in commerce and finance stood as high as 2·04. This high level was mostly accounted for by the large incomes still being earned in financial operations. If a year like 1928 or 1929 had been taken, the ratio would have been higher still.

To some extent these relative earnings in different industries may be regarded as a mechanism, perhaps very slow-acting, whereby labour may be attracted from one industry to another. It is clear, however, that no immediate deductions can be drawn from the data given above. Thus, for example, labour continues to be attracted into commerce in most countries in spite of the heavy decline in the relative income. We must analyse education and other factors controlling the supply of certain types of labour, as well as the demand price.

In any case there is a most important qualification which we must introduce, at any rate if agriculture is being considered. The marginal income may be very widely different from the average income. In commerce the difference may not be very great. In manufacture and transport, in the long run, it may even be the case that marginal returns are above average returns. In agriculture (likewise in mining) marginal returns are almost certain to be below average returns. The difference between marginal and average returns is likely to be greater in densely than in sparsely populated countries. In interpreting the figures for Australia and New Zealand, the special position of those countries should be remembered. Wool, at present prices, is the form of production yielding the highest returns per man, but most of the

land suitable for wool-growing is already being used. Any extension of production at the margin would probably take the form of meat, dairy produce or wheat, showing a marginal return well below the average.

We can analyse this problem rather more thoroughly and with more satisfactory evidence by comparing data of actual wages per hour paid to different classes of labour. In Table II which follows, unskilled urban labour is throughout taken as the standard of measurement. With it are compared the wages of agricultural labour, and of various types of skilled urban labour.

The credit for some pioneer thinking on this matter should go to Professor A. G. B. Fisher[1] of New Zealand (now with the International Monetary Fund). Professor Fisher pointed out that the margins between skilled and unskilled wages might be expected to be relatively wide in primitive countries or in countries at an early stage of industrial development, and relatively narrow in countries with long industrial experience, where the acquisition of the required skills and education was easier.

The figures in Table II give abundant support to this generalisation. At the time when Professor Fisher wrote, the United States indeed seemed to be a case of *exceptio probat regulam.* This discrepancy was very puzzling. Unfortunately, nobody in the 1930s took the opportunity of making the prediction of what has in fact come about; namely, that margins for skill in the United States have been extraordinarily reduced during the last decade. They may indeed be expected to go on narrowing further.

There was, however, one point which escaped Professor Fisher's generalisation, and only emerged as a result of further analysis. The narrowest margins of all — sometimes indeed an actual premium upon unskilled labour — appear in a fairly wealthy community when it is still in the early stages of settling a new territory, such as Australia in the 1880s, or the United States early in the nineteenth

[*contd. on p.* 532

[1] First developed in a memorandum which he prepared in the early 1930s and further expanded in his book, *The Clash of Progress and Security* (1935).

TABLE II

Relative Wages (Unskilled Urban Labour = 1)

Source: *I.L.O. Year Book,* if no other source indicated

Country and Year	Unskilled Urban Wages per Hour	Agricultural Labour (including Income in Kind)	Skilled Men: Furniture	Skilled Men: Engineering	Skilled Men: Garage Mechanics	Skilled Men: Building	Skilled Men: Truck Driving	Source
Alaska, 1953	$2·72	..	..	..	1·10	1·41	1·09	
Argentine, 1938	0·68 p.	0·55 [c]	1·31	1·35	..	1·29	1·44	
1872	4/6 per day [b]	1·66	..	1·45 [a]	..	1·39	..	Brassey, *Work and Wages*
Australia, 1953	78·3 pence	1·23	1·11	1·13	1·13	1·16	1·10	
1938	22·5 pence	0·94	1·24	1·34	..	1·44	0·95	
1929	22·0 pence	1·12	1·35	1·42	..	1·50	..	" Labour Report "
1911	12·0 pence	1·03	1·29	..	..	1·34	..	Do.[e]
1901	10·5 pence	..	..	..	..	1·43	..	Do.
1887	12·0 pence	0·50 [d]	1·25	1·12	..	1·22	..	Coghlan, *Seven Colonies of Australasia*
1872	7/9 per day	..	..	..	..	1·48	..	Brassey, *Work and Wages*
Austria,[f] 1953	6·25 sch.	..	..	1·44	1·28	1·04	1·10	
Belgium, 1953	17·9 frs.	[g]	1·30	..	1·29	1·21	1·01	
1938	5·2 frs.	..	1·23	1·23	..	1·22	1·08	
1850–95	..	[h]	..	..	..	..	..	
Belgian Congo, 1953	3·5 frs.	..	2·35	2·60	2·28	2·14	2·28	
Bolivia, 1953	34·5 bols.	..	1·48	2·25	1·54	1·48	1·55	
Brazil, 1937	4·1 milreis [i]	..	..	3·90	..	2·20	3·90	López, *International Labour Review,* Nov. 1941
1924–28	3·2 milreis [i]	..	..	2·94	..	3·11	..	*International Labour Review,* 1930, p. 649
Bulgaria, 1913	2·43 frs.[j]	..	..	..	..	1·71	..	*Annuaire Internationale de Statistique,* 1920
1895	1·75 frs.[j]	..	..	..	..	1·61	..	Do.
Canada, 1953	$1·19	0·56	0 96	1·31	1·23	1·65	1·03	
1938	45 cents	0·41	1·24	1·50	..	1·91	0·95	
1928	..	0·60 [k]	..	..	..	..	..	Lattimer, *Canadian Political Science Association Proceedings,* 1931
1913	..	0·75 [l]	..	..	..	..	..	
1900	..	..	..	..	..	..	..	
Chile, 1938	1·3 p.	0·65	1·51	1·73	..	1·48	1·35	
China, 1923–28	$2–13 per month [m]	..	..	2·70 [n]	..	2 to 3 [o]	..	*International Labour Review*
Colombia, 1938	0·12 p.	..	..	2·80	..	2·26	2·53	
Denmark, 1953	3·75 kr.	1·20	1·20	1·30	1·20	1·29	0·93	
1938 [q]	..	0·37 [p]	..	..	..	..	..	
1914 [q]	..	0·36 [p]	..	..	..	..	..	
1872	..	0·56 [r]	..	..	..	..	..	Thompson, *J.R.S.S.,* 1906

Egypt, 1950	£E75 per year	0·40	..	..	..	..	..	Issawi, *Egypt at Mid Century*.
1939	8·75piastres per day	..	..	..	..	1·43 [o]		Bonné, *Economic Development of the Middle East*
1913	6 piastres per day	0·67	..	..	..	..	..	Issawi
Finland, 1953	109 fm.	0·87 [p]	1·05	1·16	1·32	1·35	1·06	
France, 1938 [t]	6·0 frs.	..	1·10	1·24	..	1·19	1·22	
1928	2·66 frs.	0·88	1·39	1·35	..	1·38	..	
1911	0·33 fr.	0·89	1·49	1·52	..	1·51	..	
1892	0·28 fr.	0·81	..	1·72	..	1·30	..	Extrapolated back from 1928 on data given by Professor Fourastié [u]
1801	0·09 fr.	1·00 [v]	..	2·06	..	1·59	..	

[a] Blacksmith. A fitter or marine mechanic, however, received three times the labourer's wage, or more than twice the wage of his English contemporary.

[b] For general labour. A railway construction labourer received 6s.

[c] I.e. 75 pesos per month, including keep. Data from Weil, *Argentine Riddle*. Foremen received 122 pesos per month.

[d] Jeans, *Journal of the Royal Statistical Society*, 1884: figure for 1880.

[e] The evidence for these trades conflicts strongly with that given in *International Labour Review*, 1928, where Professor Richardson calculates that the over-all ratios were 1·21 in the 1920s but 1·4 in 1913.

[f] Further evidence shows that the unskilled man improved his relative position by 7 per cent between 1938 and 1949 (*Economic Bulletin for Europe*, 2nd Quarter 1950) and by 14 per cent between 1914 and 1928 (*International Labour Review*).

[g] Between 1938 and 1949 agricultural wages rose 26 per cent relative to industrial (*Economic Bulletin for Europe*, 2nd Quarter 1950).

[h] Between 1850–59 and 1880–84 agricultural wages rose 2·12-fold and industrial only 1·43-fold (Dechesne, *La Productivité du travail et les salaires*). Between 1880 and 1895 agricultural wages fell 3 per cent while industrial rose 4 per cent (Mahaim, *Journal of the Royal Statistical Society*, 1904).

[i] Agricultural wage per day taken as base (no data on urban unskilled wages). In 1937 varied between 2·6 and 7·3 according to district, and tractor drivers (comparatively few in number) received 10 milreis. In 1924–28 workers on coffee and sugar plantations received about 6 milreis. The purchasing power of the 1937 wage was about the same as that of the 1924–28 wage.

[j] Agricultural wages per day, taken as base. The man who provided his own pair of oxen earned approximately twice this wage, in both years.

[k] Lattimer's method extrapolated to 1938 also gives 0·41, agreeing with the other data.

[l] Between 1900 and 1913, a period of great economic expansion in Canada, during which average wages rose 43 per cent (Coates Report), the relative earnings of agricultural workers rose 5 per cent, construction workers also 5 per cent.

[m] Ranging from 2 in the most remote areas, 4 in North China, 5 in Central China, to 7–13 in the industrial cities. Chinese dollars were then equivalent to about one-half U.S. dollar.

[n] "Shopman" in Newchwang. A "machinist" in Canton, however, only earned 1½ times unskilled wages.

[o] Skilled men generally.

[p] Computed from 1953 from ratios given in *Economic Bulletin for Europe*, 1950.

[q] From data in *Economic Bulletin for Europe* it appears that the relative position of unskilled wages did not change between 1938 and 1953. Relative earnings of unskilled rose 12 per cent between 1913 and 1936.

[r] Between 1872 and 1904 real agricultural wages, including income in kind, only rose 1·4-fold, while the average of all real incomes in Denmark rose 2·2-fold. The relative position of the agricultural worker was apparently more favourable in the earlier year.

[s] Between 1938 and 1949 there was a relative rise of agricultural wages of 2 per cent only (O.E.E.C.).

[t] The skilled-unskilled ratio in 1947 was the same as in 1938 (*Études et Conjoncture*, February 1948). By 1949 the unskilled had a relative increase of 3 per cent only (O.E.E.C.).

[u] He shows also that relative earnings of textile workers in 1801 were 50 per cent higher than in 1892 or 1928: and relative earnings of miners a third *lower* at the earlier date.

[v] Relative wages of agriculturists appear to have been at their highest in the 1850s and 1860s, when the coefficient probably exceeded 1.

[contd. overleaf

TABLE II (*contd.*)

Country and Year	Unskilled Urban Wages per Hour	Agricultural Labour (including Income in Kind)	Skilled Men: Furniture	Skilled Men: Engineering	Skilled Men: Garage Mechanics	Skilled Men: Building	Skilled Men: Truck Driving	Source
Germany, 1953 . . .	1·58 Dm.	..	0·92	1 21	..	..	0·99	
1936 . . .	..	..	..	1·26 [a]	..	..	..	
1926 . . .	0·67 Rm.	0·58	..	1·42 [a]	..	..	..	
1913 . . .	0 43 mark	.. [b]	..	1 67 [a]	..	..	..	
1872 . . .	2·3 m. per day		..	1 56 [c]	..	1·34	..	Brassey, *Work and Wages*
Guatemala, 1953 . .	0·19 q.	..	..	..	2·64	1·27	1 32	
Hungary, 1938 . . .	0·43 p.	..	1·68	1·91	..	1 76	1·79	
1865 . . .	0 75 k. per day	0·67	..	..	..	..	..	Brassey, *Work and Wages*
Iceland, 1953 . . .	14 5 kr.	..	1 29	1·26	1·26	1·24	1·06	
India, 1951 . . .	1·57 rupees per day [c]	1·06 [d]	2·04	..	..	1·45	..	Ghosh, International Statistical Institute, Delhi Session 1951. Refers to rural areas in W. Bengal
1863 [f] . . .	9·62 rupees per month					2 39		Brassey, *Work and Wages*
1850–59 . . .	14·2 s. per month	..	..	..	..	2 31	..	Do.
1840–49 . . .	12·3 s. per month	..	..	..	..	2 34	..	Do.
1830–39 . . .	14·8 s. per month	..	..	..	..	2 05	..	Do.
Indo-China, 1939 . .	1080 frs. per year [h]	0·56 [g]	..	2·0 [e]	..	..	..	Gourou, 9th Conference, Institute of Pacific Relations
Ireland, 1953 . . .	34·4 pence	0·59 [i]	1·32	1·34	1·26	1 34	1·02	
Italy, 1938 [j] . . .	2·66 l.	0·43 [k]	1·29	1·17	..	1·38	1·11	
Jamaica, 1953 . . .	1 05 sh.	..	0·90	1·23	1·72	1·67	1·91	
Japan, 1938 . . .	0·15 y.	0 60	1·36	1·87	..	1·56	..	
1914 . . .	0·56 y. per day	0·84	..	1·49	..	1·70	..	*Journal of American Statistical Society*, 1920
1887 . . .	0·16 y. per day	0·86	..	1·40	..	1·46	..	Sale, *J.R.S.S.*, 1911
Jugoslavia, 1950 . .	3500 d. per month	..	..	1·50 [l]	..	..	..	Institut für Konjunkturforschung, 15. xii. 50
1938 . . .	3 85d.	..	1·57	2 01	..	1 66	1·37	
Martinique, 1945 . .	66 frs. per day [o]	0 85 [n]	..	1·88 [n]	..	..	..	*Foreign Commerce Weekly*, 10th November 1945
1935 . . .	13 frs. per day [o]	0 77	..	2 31 [m]	..	..	..	*International Labour Review*, 1935, p. 797
Netherlands, 1953 . .	0·98 g.	0 94	1·11	1·18	1·20	1·22	1·20	
1938 . . .	0·49 g.	0·54	1·23	1 43	..	1·29	0 82	
New Zealand, 1953 . .	60·0 pence	0·88	1·10	1·14	1·17	1·14	1·00	
1938 . . .	27·0 pence	0·71	1·22	1·11	..	1·22	0·82	
1926 . . .	22·6 pence	0·72	..	1·17 [m]	..	..	..	Richardson, *International Labour Review*, 1928
1913 . . .	..	0·77	..	1·18 [m]	..	..	..	Do.
Nigeria, 1953 . . .	5 pence	..	2·02	2·74	2·44	2·14	1·56	

N. Rhodesia, 1953	4 pence	..	2·75	..	1·25	1·50	1·75	
1932–34	39/3 per month [p]	0·88	..	..	..	..	..	*International Labour Review*, vol. xxix, p. 687, and vol. xxxiii, p. 722·
Norway, 1939	0·79 kr.	0·76 [r]	..	1·40 [q]	..	..	..	
Pakistan (East), 1953	0·14 rupee	..	3·64	2·21	4·77	2·71	1·57	*Monthly Labour Review*, 1941
Philippines, 1941	1·24 p. per day	..	..	..	2·42	1·59	..	Philippine-American Finance Commission, 1947
Poland, 1938	0·68 zl.	..	1·22	1·58	..	1·72	..	
Portugal, 1953	3·51 esc.	0·64	1·47	..	1·64	1·57	1·78	
Roumania, 1938	7·5 lei	0·61	1·58	2·10	..	2·65	1·40	
Singapore, 1953	42 cents	..	2·12	1·83	1·71	2·52	1·76	
Spain, 1953 [s]	2·94 p.	[u]	1·98	1·57	1·68	1·30	1·60	
1927	..	..	..	1·44 [m]	..	..	..	*International Labour Review*.
1913	..	..	..	1·48 [m]	..	..	..	Do.
1870 [t]	1/- per day	..	..	..	..	1·33	..	Brassey, *Work and Wages*

[a] General ratio of skilled to unskilled wages. Between 1938 and 1949 relative wages of unskilled improved 9 per cent (O.E.E.C.).

[b] Agricultural wages rose from 1 mark per day in 1855 to 1·15 in 1865, 1·45 in 1870 and 2 in 1874. The rise in real wages was 85 per cent, while other real wages in most districts of Germany probably rose by less than half this amount. (Data from Cliffe Leslie, *Fortnightly Review* 1874.) However, Brassey reports that the wages of general labour in Württemberg rose 70 per cent between 1840 and 1870.

[c] Jeans, *Journal of the Royal Statistical Society*, 1884 (data for 1880).

[d] For a man with his own plough and oxen the remuneration was approximately double (compare Bulgaria). Dr. K. N. Raj, of the Indian delegation to the World Population Conference of 1954, estimates that the minimum cost of subsistence of an unemployed rural worker supported by his relatives is ¾ rupee per day; but that such men cannot be induced to do hard work as labourers on public works unless they receive 2 rupees per day.

[e] Male domestics receive only 1·31 rupees per day in present-day Bengal, 8·56 rupees per month in Bombay and 5 in Bengal in the 1860s.

[f] Data for Bombay. For rural Bengal the labourer's wage is 6 rupees per month and the building craftsman's only 20 per cent higher.

[g] The labourer who provided his own buffalo received *three times* this wage (compare 2 : 1 ratio in India).

[h] Unskilled women urban workers 770 frs.

[i] The 1938 ratio was only 0·42 (calculated from O.E.E.C. result).

[j] By 1949 unskilled wages relative to skilled had risen 37 per cent.

[k] 0·51 for 1949.

[l] Skilled men generally. For high school teachers the coefficient was 2 and for engineers 2·3.

[m] Skilled workers generally.

[n] For cane cutting, which is very strenuous work, the figure rises to 1·87.

[o] Women's wages were 60–70 per cent of men's in 1935, 80 per cent in 1945, both in industry and in agriculture. Salaries of women clerks in 1935 were only a little above wages of unskilled labour.

[p] Railway wage, including income in kind valued at 25s. 9d. (as in the mines). In the mines, exclusive of keep, the wage was 34s. in 1932, as against only 6s. to 9s. in Tanganyika, and 50s. which could be earned by migratory workers in Gold Coast or Senegal. In Belgian Congo, where prices were twice as high, a miner received a cash wage of 41s. and keep worth 56s. On the Ivory Coast, where prices were much lower, a migratory worker received a cash wage of 26s. and keep worth 9s. 6d. in 1929. (The 1914 cash wage was 24s.)

[q] Unskilled wages rose 14 per cent relative to skilled between 1938 and 1948 (O.E.E.C.).

[r] Appears to have risen to 1·18 by 1953. Was 0·78 in 1927.

[s] A locomotive engine-driver receives 3·3 times the unskilled wage (Thorndike, *Quarterly Journal of Economics*, May 1940).

[t] These were the conditions at the beginning of Brassey's construction contract. By the end of it, wages of unskilled labour had risen 3-fold, of skilled 3¾-fold.

[u] The ratio of agricultural to urban wages rose by a factor 1·45 between 1938 and 1948 (O.E.E.C.).

[v] Skilled labour in general (*Monthly Labour Review*, July 1944).

[contd. overleaf

TABLE II (*contd.*)

Country and Year	Unskilled Urban Wages per Hour	Skilled Men: Agricultural Labour (including Income in Kind)	Skilled Men: Furniture	Skilled Men: Engineering	Skilled Men: Garage Mechanics	Skilled Men: Building	Skilled Men: Truck Driving	Source
Sweden, 1953	4·45 kr.	0·60	0·97	1·16	..	1·62	1·02	
1938	1·57 kr.	0·47 [a]	0·96	1·03	..	1·43	0·92	
Switzerland, 1953	3·13 fr.	[b]	1·02	..	0·86	0·95	0·94	
1938	1·37 fr.	..	1·29	1·26	..	1·23	1·12	
Syria, 1953	34·5 piastres	..	1·28	1·54	2·18	2·55	1·95	
1934	4·5 fr. per day	..	..	2·22 [c]	..	..	..	*International Labour Review*, vol. xxix, p. 409
Thailand, 1941	0·75 baht per day	0·67	..	..	..	3·33 [d]	2·00	Department of Public Works, privately communicated
1937	..	..	..	2·50	..	1·81	1·74	*Year Book*
1914	..	..	..	2·42	..	2·00	..	Do.
Union of South Africa, 1934	£4 per month	0·35 [e]	..	..	..	..	..	Knean, *South African Economic Journal*, 1935
United Kingdom, 1953	2·87 sh.	0·87	1·23	1·13	1·12	1·23	0·98	
1938	13·5 pence	0·59	1·47	1·30	..	1·47	1·27	
1880–1914	..	..	..	1·72	..	1·52	..	Knowles, *Oxford Bulletin of Statistics*, 1951
1869	17/- per week	0·72	..	1·71	..	1·50	..	Brassey, *Work and Wages*
1851	14/- per week	0·69	..	..	..	1·50	..	Do.
1846	..	..	..	..	..	1·38	..	Do.
1843	15/- per week	0·78 [f]	..	..	..	1·40	..	Do.
1790	£30 per year	0·67 [k]	..	1·50 [c]	..	..	..	Gilboy, *Wages in 18th Century England*
1770	£30 per year	0·63 [k]	..	1·43 [c]	..	..	..	Do.
1700	£25 per year	0·57 [k]	..	1·50 [c]	..	..	..	
United States, 1953	$1·54	0·44	..	1·36	1·63	1·98	1·33	
1938	41·0 cents	0·38	..	2·12	..	3·36	1·92	
1926	43·3 cents	0·49	..	1·82	..	3·04	..	Douglas, *Real Wages in the U.S.*
1913	20·4 cents	0·63	..	1·66	..	2·73	..	Do.
1900	15·1 cents	0·52	1·82 [h]	1·61	..	2·43	..	Do.
1890	14·8 cents	0·51	1·84 [h]	1·65	..	2·30	..	Do.
1880–89	14·5 cents	..	1·80 [h]	1·56 [g]	..	1·64	..	National Association of Manufacturers "The American Individual Enterprise System"
1870–79	14·8 cents	..	1·84 [h]	1·60 [g]	..	1·67	..	
1860–69	12·4 cents	..	1·80 [h]	1·64 [g]	..	1·65	..	Do.
1850–59	8·6 cents	..	1·86 [h]	1·61 [g]	..	1·55	..	Do.
1840–49	7·2 cents	..	2·07 [h]	1·73 [g]	..	1·64	..	
1830–39	7·4 cents	..	..	1·69 [g]	..	1·47	..	
1820–29	6·7 cents	0·67 [i]	..	1·42 [g]	..	1·23	..	
1810–19	8·3 cents	..	..	1·21 [g]	..	1·05	..	
1800–09	7·0 cents	..	..	1·33 [g]	..	1·15	..	
1790–99	4·9 cents	..	..	1·26 [g]	..	1·09	..	

[a] This ratio was 0·42 in 1924 and 0·56 in 1914 (O.E.E.C.).
[b] Agricultural wages relative to industrial increased by a factor 1·22 between 1938 and 1949 (O.E.E.C.).
[c] Skilled men in general.
[d] Electrician.
[e] Allowing for the higher purchasing power of money in rural areas, this is equivalent to half the urban wage. Women's wages are 90 per cent of men's.
[f] From Professor Bowley's figures, this ratio appears to have been 0·80 in 1830 and 0·88 in 1820.
[g] Skilled factory workers generally.
[h] Printers.
[i] General figure for early nineteenth century (Watkins and Dodd, *Labour Problems*).
[j] Engineers' wages, relative to wages in general, were the same in 1824 as in 1900: but in the intervening period they were relatively higher. The ratio rose to a maximum of about 1·95 in 1845.
[k] At this time rural prices were much below prices in London, to which city the urban wages refer, and the ratio of real wages was a good deal higher than this.

century. Under these circumstances, indeed, we can still see how a relative shortage of unskilled labour would come about. At a later date this tends to be made good by immigration and a more normal relationship restored.

We also reach the same conclusion, in an interesting way, by comparing regional figures within the United States at the present time.

Relatively high wages for skilled men in the engineering trades prevail at the stage when the mechanical industries are just developing. Very high figures prevail in some undeveloped countries now, and Britain passed through the maximum about 1845. In nearly every country this figure shows a downward tendency, and in many countries now the margin is very small indeed.

In the building trades, fairly wide margins also prevail in the undeveloped countries. In this case we are not dealing with new technical knowledge which has to be acquired, as in the engineering trades, but that from ancient crafts. On the other hand, in many countries there may be difficulty in acquiring the degree of literacy required to practise as a building craftsman; or access to the trade may be made difficult by guild or Trade Union restrictions.

It is probably the varying severity of these restrictions on entry, a rather arbitrary matter, which accounts for much of the differences between the coefficient in different countries. The coefficient in the U.S.A. rose to an unprecedented height in 1938 and has since fallen heavily. In this case it may well have been that the Unions made their restrictions more stringent than ever to compensate themselves for the serious unemployment then prevailing.

So far as the building trades are concerned, we are indeed fortunate in having a series prepared by Lord Beveridge [1] showing the ratio between wages of carpenters and labourers on seven manors, over the period 1280–1460. These give the interesting result that the ratio started

[1] *Economic History Review*, 1946.

high, but was falling in the early part of the fourteenth century, and remained particularly low for a century after 1350.

1280–	2·02	1370–	1·36
1290–	1·88	1380–	1·31
1300–	1·88	1390–	1·25
1310–	1·83	1400–	1·31
1320–	1·79	1410–	1·22
1330–	1·79	1420–	1·18
1340–	1·59	1430–	1·23
1350–	1·38	1440–	1·26
1360–	1·32	1450–	1·30

We know particularly from J. C. Russell's study [1] that the Black Death of 1349, though it occupies such a unique place in our history books, was in fact only the first of a series of recurring epidemics, which probably brought about a substantial population reduction, certainly a cessation of growth, in the second part of the fourteenth and first part of the fifteenth centuries. Such a state of affairs would almost certainly have brought about a relative scarcity of *unskilled* labour and would account for the low ratio shown. But we must not treat this as the sole factor at work. It is the fall in the ratio before 1349 that is interesting. It appears that this must be attributed to an increasing number of men, freed from feudal restrictions, taking up the trade of carpentering, and a freedom from guild restrictions (at any rate in rural areas) which enabled them to enter the trade.

A regional analysis will throw more light on the extraordinary figures for the U.S.A. A general review, covering all trades but giving its results in an approximate form, was prepared by the U.S. Department of Labour.[2]

Table III shows an equalising trend between 1907 and 1919, resumed again after 1937. Throughout the

[1] *English Mediaeval Population.*

[2] *Monthly Labour Review*, August 1948. The last column was prepared from some supplementary information published in *Monthly Labour Review*, November 1953, and relates only to the wages of carpenters and electricians as skilled men, and janitors as unskilled.

South has been the region of greatest inequality, the West of greatest equality.

TABLE III

WAGES OF SKILLED MEN (UNSKILLED = 100) IN U.S.A. BY REGIONS, 1907–53

	1907	1918–19	1931–32	1937–40	1945–47	1952–53
U.S.A.	205	175	180	165	155	137
North-East	200	165	175	..	155	137
South	215	195	190	..	170	146
Mid West	190	175	170	..	150	138
Far West	185	170	160	..	145	134

For the building trade a more detailed analysis is possible by size of city.[1]

TABLE IV

BUILDING WAGES IN U.S. CITIES, JULY 1949
$ PER HOUR

Population of City	Journeymen	Helpers	Ratio
Over 1,000,000	2·50	1·72	1·45
500,000	2·36	1·60	1·48
250,000	2·22	1·48	1·50
100,000	2·14	1·36	1·57
40,000	2·04	1·24	1·64

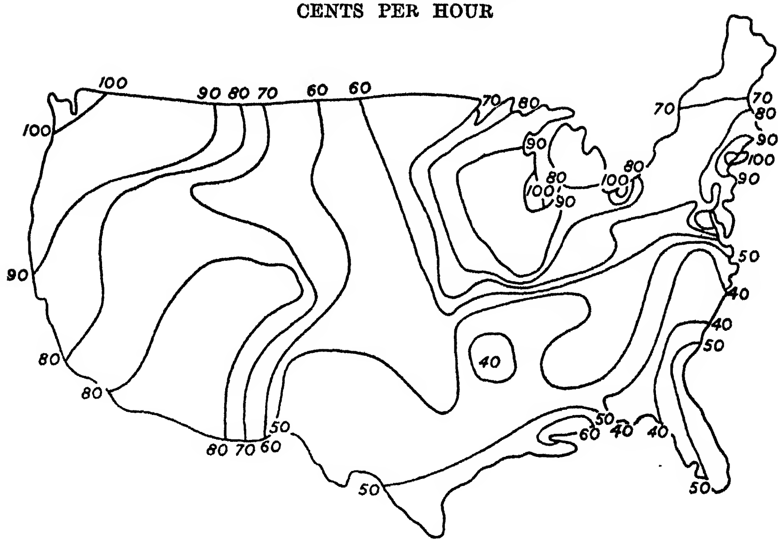
A long-period comparison going back to 1874[2] shows that the ratio between craftsmen and labourers' wages in the building trade in New York was *greater* than the national average up to about 1890, but *less* than the national average in more recent times. In a number of other large industrial cities the relative wage of craftsmen was again lower than in New York, particularly in San Francisco and Seattle.

On the wage data for 1942,[3] contour diagrams were constructed, showing the wage rates of common labour

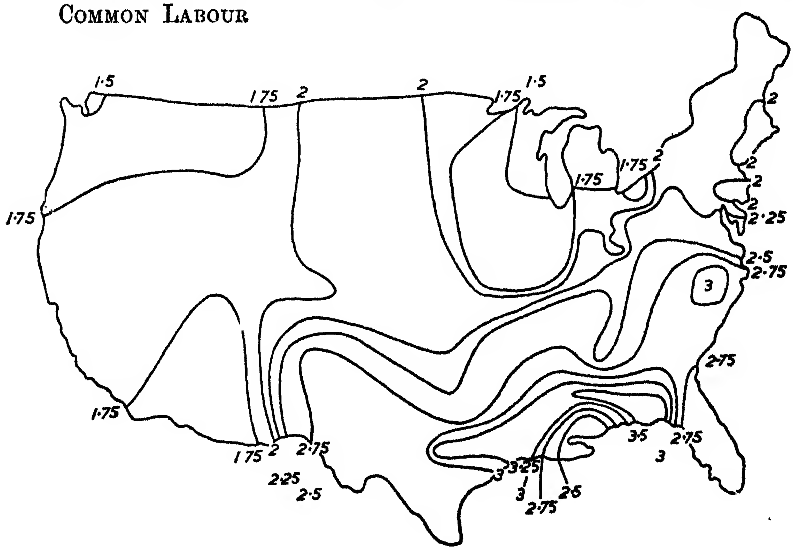
[1] *Monthly Labour Review*, December 1949.
[2] Published annually in April of each year in *Engineering News-Record.*
[3] *Engineering News-Record*, 23rd April 1942.

Contours of Wages of Common Labour

cents per hour



Contours for Ratio between Average Wages of Carpenters, Bricklayers and Structural Ironworkers and Wages of Common Labour



and the ratio of craftsmen's wages throughout the U.S.A. These diagrams make it clear that the cause of the disparity is the unusually low wages for unskilled labour in the South-East, apparently due to the presence of a large coloured population, while the earnings of craftsmen do not vary so much between regions. This situation has probably already been considerably modified since 1942.

It is sometimes urged that, in many countries, the severity of the winter weather makes building work impossible for a considerable part of the year, and that therefore builders require correspondingly high hourly wages while they are working. By this reasoning, we should expect the margins in countries like Finland and Sweden to be higher than in southern European countries, but they are not; and the builders' margins in Canada are lower than in the United States.

The comparatively low degree of mechanical skill required to drive a motor truck should be abundant in an economically developed country; and indeed in many cases we find that the wage for such work is now at or below the level of ordinary unskilled labour, which calls for a greater muscular effort. It will be seen, however, that there are still a number of countries in which even this degree of skill calls for high relative remuneration.

Some extremely valuable information about relative wages all over the world about 1870 is available in Thomas Brassey's *Work and Wages*. Brassey was the outstanding railway construction contractor of his day, and learnt about labour at first hand. Comparing all the countries of Europe, and also Canada and India, he reached the broad conclusion that the productivity of unskilled labour was about proportional to the money wages it received. Serf labour in Russia or the Austro-Hungarian Empire (we should remember that railways began before serfdom ended), he found, worked with an efficiency only one-half to one-third that of the Englishman.

In some countries in the 1870s transport and communication was still so little developed that very wide changes of wages, or variations between regions, were

possible. Thus the figures for Spain, quoted in the table, show unskilled wages rising three-fold during the course of a single contract, with skilled wages rising faster still — an interesting microcosm of the condition whereby a country in the early stages of development may find itself relatively short of skilled labour. On a construction contract in Canada (where communications were a little better) in 1872, Brassey found labourers' wages rising 70 per cent, from 85 cents to \$1·45 per day, during the course of construction. Masons' wages were \$1·80 per day and apparently did not change much during the course of the contract. In Canada, a sparsely populated country, it was a relative shortage of *unskilled* labour which first appeared.

Considerable interest attaches to the trend of the relative incomes of domestic servants. A most interesting historical study for England has been prepared by Mr. T. H. Marshall.[1] In 1634, the earliest year recorded by him, both men and women servants received between £1 : 10s. and £2 : 10s. per year, plus their keep, which we may put at £4 : 6s. per year on the basis of Gregory King's figures of average food consumption and rent per head of population in 1688, or, if we assume that servants were also provided with clothing, £6 : 3s. on the same basis.[2] The average wage of a labourer in 1688 was £15, and King estimated the average artisan income at £40. Though the data are not clear, it appears that domestics' earnings in the seventeenth century were well below those of outside wage workers.

During the eighteenth century factors seem to have been operating, though we cannot analyse their relative significance, to raise the relative earnings of domestics — perhaps the wage-earning population enjoyed an increased mobility, demand for domestic servants increased owing to high incomes of landowners and increasing concentration of property, and to expanding factory and workshop industries competing for labour. London footmen, who received keep and tips (and livery ?) in addition to their wages,

[1] *Economica*, 1929. [2] *National Income and Outlay*, p. 219.

received £5 per annum in the early eighteenth century, £10 per annum in the later eighteenth century. Men-servants providing their own food, in the latter period, received £39 per year, while labourers received only £30, craftsmen £45.[1] Mr. Marshall has collected abundant evidence in literature of employers' complaints about the rising wages of women domestics, who by the end of the century were earning wages not far short of the men — " a fat Welsh girl, just come from the country, who scarce understood a word of English, capable of nothing but washing, sweeping and scouring " expected her keep, plus six guineas per annum wage, plus a guinea per annum " tea-money ". A really experienced woman cook could command £21 per year. In the country wages were only a pound or so below London levels, though perhaps the keep provided was more austere. But they were probably considerably better off than the farm labourers, who earned £20–£25, plus some drink and a few perquisites.

The course of domestic wages through the nineteenth century was traced by Sir Walter Layton[2] in a diligent study of newspaper advertisements and other original sources. In 1911 average income of female domestics, including keep, was valued by Professor Bowley at £37, while average wage of women and girls employed in industry was £31 in 1906. How this position was built up may be seen from Sir Walter Layton's data, expressing the ratio of domestic to general female wages (1900 = 1) :

1823–27	·70	1863–67	·83
1828–32	·78	1868–72	·82
1833–37	·85	1873–77	·81
1838–42	·91	1878–82	·87
1843–47	·97	1883–87	·94
1848–52	·95	1888–92	·97
1853–57	·89	1893–97	·98
1858–62	·83		

These unexpected trends would well repay further study.

[1] Gilboy, *Wages in Eighteenth Century England.*
[2] *Journal of the Royal Statistical Society*, 1908, p. 515.

After 1911, approximately the same ratio appears to have obtained until the 1930s. A similar study for Chicago over the period 1890–1929 was made by Professor Douglas.[1] Assuming that the value of keep was $6 per week in 1926, and varied with the retail prices index for the other years, we obtain the following ratio of domestic wages to average female factory weekly wages (National Industrial Conference Board data since 1920, carried back for earlier years by index of wages in textile, clothing and confectionery trades):

Ratio of Domestic Wages to Average Female Factory Wages

1890–94	1·11	1910–14	1·35
1895–99	1·13	1915–19	1·18
1900–1904	1·21	1920–24	1·23
1905–09	1·26	1925–29	1·15

The comment by Mr. George Stigler[2] that between 1899 and 1939 domestic servants' incomes probably did not change relative to manufacturing wages, is literally true, but conceals a marked upward movement from 1890 to 1914,[3] followed by a downward movement. Further analysis is certainly desirable.

Quite an interesting table for Norway (Table V) can also be compiled over the same period.[4]

Finally we may examine the relative position of those performing clerical, professional and administrative duties. It is in these fields that we naturally expect relative earnings to be highest in the least-developed and least-literate countries. Thus, to give two examples,[5] in Cuba, when unskilled labour was paid $2 per day in Havana (25–30 per cent less in the rest of Cuba) ordinary male clerks earned $4–$6 per day. In the Dominican Republic the

[1] *Journal of American Statistical Society*, 1930, p. 48.

[2] National Bureau of Economic Research, *Occasional Paper 24*.

[3] The Coates Report on *Wages and Prices*, 1915, shows that in Canada, between 1900 and 1913, domestic wages rose relative to general wages by 20 per cent.

[4] Data from *Annuaire International de Statistique*, 1920.

[5] International Reference Service, October 1945.

ratio was wider, unskilled labour being paid 0·75 to 1 peso per day, salesmen 3 pesos per day.

TABLE V

	Average Daily Cash Wage of Women Domestics (Annual Wage ÷ 300), kr.	Do. including Income in Kind*	Ratio to Wage of Women Factory Workers
1885 urban . .	0·28	0·60	0·53
1885 rural . .	0·24	0·70	0·72
1900 urban . .	0·43	0·92	0·60
1900 rural . .	0·33	0·80	0·67
1915 urban . .	0·72	1·70	0·57
1915 rural . .	0·64	1·35	0·68

* Income in kind computed from difference in wages with and without board and lodging, paid in other trades.

Table VI gives for the U.S.A. ratios of average salaries, per hour, to unskilled wages. Up to 1926 the data are from Professor Douglas's *Real Wages in the U.S.* The figures are kept up to date by means of average salaries for 1938 shown by Professor Kuznets in *National Income and its Composition* and for 1951 in the National Income Estimates published in *Survey of Current Business.*

As the earnings of unskilled labour, which we take as a basis of comparison, are given on an hourly basis, and other earnings on an annual basis, we have to make some assumptions about average hours. For clerical work there are estimated to be 40 per week since 1938, 48 previously. For 1938 and 1951 the average salary in wholesale and retail trade is taken as representative of clerical wages. For the Federal Civil Service and the Post Office hours are taken at 41 throughout. Teachers' hours are taken at 1200 per year, except to allow for the part-time teaching which prevailed before 1926. The average hours worked by clergy are taken at 40 per week throughout.

The earnings of teaching, relative to other labour,

have always constituted an interesting economic problem. It was discussed by Ibn Khaldun in the fourteenth century. Of professors and teachers he wrote that " their wealth is limited, because the need of society for them is not great, and at times they have been considered unnecessary; furthermore they refuse to have recourse to flattery of powerful potentates in order to be patronised by them and through their prestige gain wealth: they consider this as dishonourable ".

TABLE VI

	1890	1900	1913	1926	1938	1951
Average unskilled earnings, cents per hour	14·8	15·1	20·4	43·3	48·2	143·0
Relative earnings:						
Clerks	2·29	2·67	2·42	1·48	1·42	1·10
Federal Civil Service	3·57	3·37	2·59	1·95	1·78	1·26
Post Office	2·38	2·46	2·21	2·00		
Clergy	2·58	2·33	2·07	2·03	1·78	0·77
Teachers	1·83	2·16	2·42	2·48	2·44	1·40
Professor Stigler's estimates for teachers:						
Rural	..	1·40	1·71	1·80	1·51	..
Urban	..	4·15	3·54	3·47	3·40	..

In the U.S.A. Professor Stigler's figures show the teacher improving his relative position up to the 1920s but losing again since. Professor Stigler's figures cannot be fully brought up to date; but the urban primary school teacher whose average hourly earnings (assuming a 1200-hour year) stood at 3·4 times the average unskilled wage in 1938, stood at 3·15 in 1941 and 2·71 in 1949. For urban secondary teachers the corresponding figures were 3·86 and 3·12. The salaries of university teachers in relation to those of urban primary and secondary school teachers were calculated by Professor Stigler as follows: 1910, 2·39; 1920, 1·97; 1926, 1·65; 1938, 1·47; 1942, 1·43; 1949, 1·29.

For Australia, however, Professor Gordon Wood in

the pamphlet, *The Purchasing Power of a Pedagogue*, finds that male teachers' salaries in the State of Victoria fell relative to wage-earners' incomes by 25 per cent between 1911 and 1944 (but female teachers by only 5 per cent): incomes of New Zealand university professors by 36 per cent and lecturers by 28 per cent relative to wage-earners, between 1914 and 1940. Incomes of Australian university lecturers fell 16 per cent; of professors were maintained unchanged, relative to wage-earners, between 1920 and 1940.

The same tendencies are also marked in the case of U.S. postal employees and Federal public servants. In the 1890s a man with the necessary degree of education and other qualifications[1] to enter the Federal Public Service was in a very privileged position, enjoying much shorter hours as well as much higher wages than the industrial worker. These privileges have now disappeared. Owing to the relative stability of these salaries, the series is subject to abnormal fluctuations in years like 1920 and 1932, but in general the trend is seen to be strongly downwards. In the case of ministers of religion, the trend seems to be definitely downwards.

It can only be concluded that the increased supply of skilled labour in the U.S.A., created by industrial progress and better education, has been more than taken up by the increased demand in certain occupations. It appears that American education is designed more to produce clerical workers than skilled manual workers. Thus, between 1910 and 1947, the demand for clerical workers and salesmen in the U.S.A. rose from 10·2 to 18·2 per cent of the occupied population, yet the supply of this labour was so abundant that its relative remuneration was heavily reduced.[2] During the same period the demand for skilled workers only rose from 11·7 to 13·3 per cent of those occupied, yet apparently the supply in a number of occupations was deficient.

[1] Information is not available to throw light on the relative importance of educational and of political qualifications in appointments to the Public Service at that time.

[2] Regarding the years after 1938, Federal Reserve Bank indexes show that clerical and professional salaries rose only 57 per cent between 1939 and 1947, while manufacturing wages doubled.

Professor Fourastié[1] has assembled data from which he can compute, roughly, the long-term trend of real salaries in the French Civil Service and teaching profession. Taking 1910 as 100 throughout, we obtain :

TABLE VII

	Office Boys	Civil Service Principals (Chefs de Bureau)	Civil Service Heads of Departments (Directeurs Généraux)	Highest ranking Posts (Conseilleurs d'État)	School and University Teachers
1815	96	85	110	111	88
1860	85	81	108	168	..
1875	87	..	108	108	81
1925	106	119	107	62	69
1940	..	103	102	94	112
1948	103	73	58	56	74

The deterioration in the relative position of the higher-salaried and professional man is also very strikingly shown for the Netherlands by the diagram on page 544.[2]

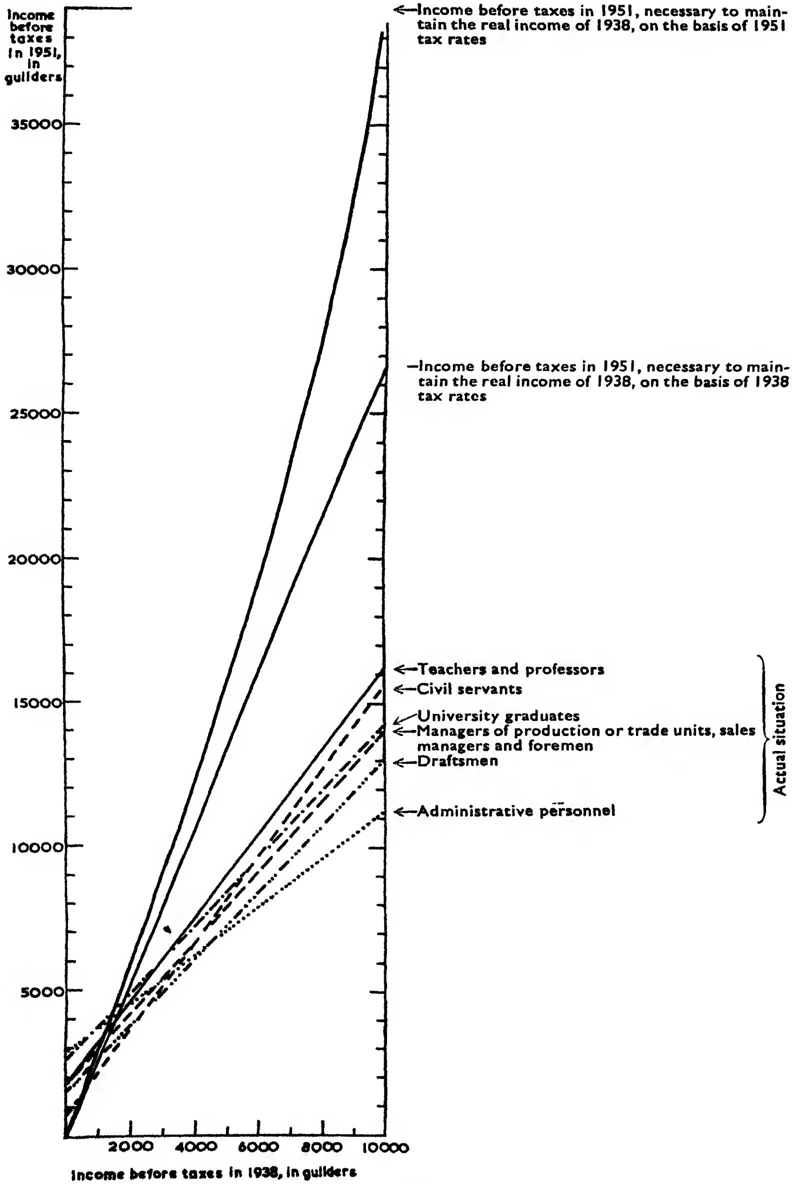
The relative earnings of unskilled, skilled, clerical and other workers measure the effect of both changes in demand and of changes of supply of the different types of labour. Another angle on this problem is obtained by measuring the relative amounts of unemployment which prevail for different classes of labour, at various times and places. To obtain really comprehensive records of unemployment we generally have to rely on Census data, except that, for the U.S.A., annual Labour Force statistics are now sufficiently comprehensive.

The comparative constancy of some of these ratios is remarkable, especially when we see that more or less the same ratios prevail both under the extreme unemployment of the 1930s and the very full employment of the present day. It is hard to explain the constancy of such ratios from the demand side. There may possibly be an explanation on the supply side; especially for the persistently

[1] In *La Civilisation de 1960* and *Le Grand Espoir du XX^e. siècle.*

[2] I acknowledge with thanks permission to reproduce this diagram from *De Financiële Positie van de Middengroepen in Loondienst,* by Dr. J. G. M. Delfgaauw and A. I. V. Massizzo.

INCOME NECESSARY IN 1951 TO MAINTAIN THE REAL INCOME OF 1938 CALCULATED ON THE BASIS OF TAX RATES IN 1938 AND OF TAX RATES IN 1951, COMPARED WITH THE ACTUAL INCOME IN VARIOUS PROFESSIONS (MARRIED COUPLES WITHOUT CHILDREN)



high unemployment among unskilled manual workers, which may perhaps be explained by the rate at which labour enters this category by "falling" from better-paid occupations, due to various misfortunes and accidents.

We must now, however, turn our attention to the more long-period problems of the supply of labour to different occupations. Why are a certain number of men, now, offering themselves for employment as unskilled labour, or in any other field? In spite of all the supposed "mobility" of modern society, one of the most important

TABLE VIII

RELATIVE RATES OF UNEMPLOYMENT AMONG MALES IN DIFFERENT OCCUPATION GROUPS

	England and Wales, 1931	Great Britain, 1951	U.S., 1940	U.S.,* 1940	Australia, 1933	Canada, 1931
General rate of unemployment per cent	12·7	2·1	13·8	5·5	18·9	19·6
Ratios to general rate:						
Unskilled manual	2·40	2·42	2·41	2·28	2·45	1·88
Agricultural wage workers	0·60	0·76	0·90	0·71	0·70	0·99
Personal service workers	0·78	1·85	0·89	1·11	1·09	0·61
Salesmen and shop assistants	0·62	1·05	0·64	0·63	0·97	0·53
Clerks	0·43	0·57	0·67	0·69	0·70	0·41

* Male and female.

reasons, statistically, why men are offering themselves for a particular kind of job, is simply that their fathers also were engaged in similar employment. Of course, we do well to examine the causality of the relationship more closely: whether men in certain occupations cannot afford to pay for the education or apprenticeship which they would like to have had for their sons, or whether employers tend to judge sons on the achievements of their fathers, or whether it is a simple but natural tendency for sons to try to imitate their fathers' careers. But, whatever the mechanism may be, we cannot get away from the fact that the present-day employment of a great number of

men seems to have been determined by the employment of their fathers.

This interesting branch of knowledge is described rather unfortunately by some researchers as the problem of "social mobility". Such a title should include studies both of changes of occupation within a man's lifetime, and of the tendency for occupations to be inherited. Both these problems have been largely neglected up to now; but rather more work has been done on the problem of inheritance of occupation, which appears, at first sight, to be the more important of the two problems.

In the first decade of this century some pioneer work was done by Chapman in England and Chessa in Italy. In 1929 Professor Ginsberg published some further studies in London. Arising out of the *New Survey of London Life and Labour*, Professor Sir Arthur Bowley[1] published the results of a much larger study covering several thousands of families in London. Unfortunately this study was vitiated by two defects, (1) it covered only families where the head of the family was either a manual worker or a retail salesman, (2) records of the sons' occupations were only obtained for those sons who were still living in their fathers' homes, and therefore heavily biased in the direction of the younger or less successful men. The remarkably high degree of apparent "occupational inheritance" shown by Sir Arthur Bowley's study therefore is partly due to statistical bias.

Up to the 1930s studies in this field in the U.S.A. were confined to some interesting but limited investigations, such as those of Taussig, into the families from which successful business managers had sprung. A much more thorough and comprehensive technique was pioneered by Professors Anderson and Davidson[2] in a study which throws a flood of light on the economic mechanism through which labour is selected for different occupations. In a flourishing and newly developed city of moderate size in

[1] *Economica*, 1935.

[2] *Occupational Mobility in an American Community*, Stanford University Press, 1936.

California (San José) they set out to collect complete occupational and educational records for a substantial sample of the whole male population, at about the middle of their careers.

The study shows that the degree of hereditary stratification in American life is somewhat larger than is supposed.

TABLE IX

	Out of each 100 Men now Engaged in—					
	Professional Occupations	Proprietors and Managers of Businesses	Clerical Occupations	Skilled Manual Occupations	Semi-skilled Manual Occupations	Unskilled Manual Occupations
Fathers were engaged in :						
Professional occupations .	10	2	9	4	4	3
Farming, proprietors and managers of businesses	61	73	46	38	41	44
Clerical occupations .	9	5	7	3	2	2
Skilled manual occupations	9	11	20	39	24	8
Semi-skilled manual occupations . . .	6	1	3	5	10	4
Unskilled . . .	5	8	15	11	19	39
Received education :						
College 3 or more years .	100	10	..	..	..	..
College 1–2 years . .	..	12	6	..	..	..
Primary and high school, 11 to 12 years in all .	..	20	64	13	26	11
Primary and high school, 9 to 10 years in all .	..	18	18	11	8	..
Primary school only, 5 to 8 years . . .	..	22	12	71	66	48
Primary school only, 4 years or less . .	..	18	..	5	..	41
First employment was :						
Higher type of occupation than present . .	..	..	..	..	..	3
Present type of occupation	60	42	82	13	51	97
Lower type of occupation	40	58	18	87	49	..

Considerable regional differences are to be expected ; but more recent results given above show that the degree of occupational inheritance is of a similar order of magnitude in the much larger industrial city of Indianapolis.

In the table above, the first six lines represent an analysis of 1547 men now in work ; the full record of

education and of previous employment was obtained from a smaller sample.

Men between 20 and 34 were found to have pursued, on the average, more than three different occupations; men over 35 more than four. This indicates a considerable and probably unnecessary extent of trial and error in the choice of occupations. But Table IX indicates that,

TABLE X

	Occupations of Fathers					
	Professional	Farmers, Proprietors and Managers of Businesses	Clerical	Skilled Manual	Semi-skilled Manual	Unskilled Manual
Total number of sons	77	794	70	295	69	242
Average per family	2·5	2·7	2·2	2·3	2·0	2·8
Percentage distribution of sons between:						
Professional	25	15	26	6	16	4
Farmers, proprietors and managers of businesses	10	32	23	14	7	10
Clerical	26	13	23	15	9	14
Skilled manual	18	15	16	42	25	14
Semi-skilled manual	12	11	7	17	29	16
Unskilled manual	8	14	7	6	14	42
Figures for previous generation:						
Professional	29	6	0	5	0	3
Farmers, proprietors and managers of businesses	44	66	27	21	23	17
Clerical	10	6	20	11	12	0
Skilled manual	12	11	53	49	31	16
Semi-skilled manual	2	2	0	5	31	4
Unskilled manual	3	9	0	9	3	60

spite of this superficial mobility, American society is in danger of forming highly stratified classes. Entry to professions is confined by law or custom to those with three years of college education, which in effect confines it almost entirely to the children of business and professional men, with a small proportion from poorer families. The business class appears to be also highly stratified; children of business men and farmers constituted three-quarters of its numbers. These children have had all kinds of educa-

tion, ranging from the highest to the lowest, and a surprisingly large number of them (42 per cent) start managerial work as soon as they finish their education without having to graduate through clerical work.

The clerical class is of more mixed parentage and of more mixed education. The outstanding feature of this class is that most of those engaged in it started on clerical work as soon as they left school.

The skilled manual class, on the other hand, only contains a small proportion of men who were apprenticed or otherwise entered the skilled trades on leaving school.

TABLE XI

Occupied Males in Canada over 25 in 1941

(Thousands)

	Occupations in 1931						
	Agriculture	Industrial	Commerce and Finance	Service	Clerical	Labourers	Total
Numbers occupied in 1931	862	883	225	210	129	194	..
Occupations in 1941:							
Agriculture . .	725	29	4	4	1	13	776
Industrial . . .	81	766	20	13	13	52	945
Commerce and finance	13	23	182	6	12	5	241
Service . . .	13	28	9	181	7	10	248
Clerical . . .	3	10	7	3	94	2	119
Labourers . . .	27	27	3	3	2	112	174

The great majority graduated to skilled work from unskilled or semi-skilled. The majority also have not had a high-school education; and this class is largely recruited from the children of farmers and business men. It is certainly a curious paradox that the semi-skilled class has, on the whole, a somewhat better education than the skilled. The unskilled class is recruited largely from the children of unsuccessful farmers and the children of unskilled labourers.

Another opportunity of studying short-term changes of occupation within a man's career (Table XI) was given by the Canadian Census of 1941, which tabulated men's occupa-

tions at that date, in comparison with the occupations that they had been following at 1931. It is true that this survey covers a very depressed decade; but even so, the degree of occupational mobility appeared to be much less than might have been supposed. In the case of agriculture, a declining occupation, 93 per cent of those at work in 1941 were survivors of the agricultural labour force of 1931 and only 7 per cent new entrants. In no other group of occupations was this ratio so high.

Only a rough outline analysis can be made in these large occupational groups. A full table by individual occupations, at both Census dates, is available but is statistically rather unmanageable. Probably the most significant information to extract is to survey those occupations in which, of all those employed in 1941, a significant proportion had been drawn from occupations of an entirely different type in 1931 (Table XII). (We confine the tabulation to men over 25 in 1941, so as to exclude young new entrants into occupations.) In most occupations, somewhere between 20 and 30 per cent of those engaged in 1941 were found to have been drawn from quite different occupations a decade earlier. Let us therefore concentrate our attention upon occupations in which such movement was unusually low (below 20 per cent) or unusually high (above 30 per cent). We would naturally expect rapidly expanding occupations to have a very high proportion of new entrants, declining occupations very low. This is generally true; but there are some interesting exceptions.

A series of modern studies of occupational inheritance have recently become available in different countries. Though the definitions and methods are not entirely comparable, they are nearly enough so to enable us to make some preliminary international comparisons. Miss Natalie Rogoff,[1] a young pioneer in this field, has prepared two large comprehensive tables for the city of Indianapolis, referring to all men who married in the county in the periods 1905–12 and 1938–41 (the occupations of both the

[1] *Recent Trends in Occupational Mobility*, Glencoe, Illinois, The Free Press, 1953.

TABLE XII

CANADA, 1941

Of the men at work in specified occupations, who were over 25, proportion who had been engaged in an *entirely different type* of occupation in 1931 :

	Unusually Low		Unusually High		
	Under 10%	10–20%	30–40%	40–50%	Over 50%
Occupations which expanded 1931–41 by 40 per cent or more		Toolmakers Accountants		Fitters Filers and grinders Metal furnacemen Sawyers	Watchmen
Do. 20–40 per cent		Card grinders Wholesale traders	Loggers Miners Policemen	Truck-drivers	Janitors Male nurses
Do. under 20 per cent	Professions		Floor-walkers		Boarding-house keepers
Occupations whose change 1931–41 not known		Photography	Electrical repair men Welders General labourers	Gangers Boiler firemen Packers	
Occupations which contracted 1931–41 by 10 per cent or less		Patternmakers Paper-makers Jewellers Furriers Cobblers			
Do. 10–20 per cent	Barbers Loco engineers Tailors Engravers Bookbinders Fishermen and trappers	Upholsterers Cabinetmakers Blacksmiths Bakers	Waiters		
Do. 20 per cent or more	Farmers and farm workers Printers Telegraphists	Coopers Master builders Stockbrokers Bricklayers Plasterers Loco firemen	Bus and taxi drivers		

bridegroom and of his father have to be entered upon the marriage register). As her tables give each occupation singly it is possible to re-group them to fit the classifications used in other countries where necessary.

Professor Glass and his staff in the London School of Economics have recently, with Government help, completed a fairly large survey for Great Britain. Instead of the conventional grouping of occupations which many investigators have hitherto used they attempted to make a scientific grouping on the basis of the "esteem" in which various occupations were held, as shown by the answers of a number of representative citizens interviewed. Unfortunately Professor Glass's conclusions led him to group together skilled manual workers, salesmen and clerical workers in one class in his list, which reduces its value for comparison with other countries. The French Institut National des Études Démographiques made an interesting collection of family histories, occupational and educational, of over a thousand French families.[1] A smaller sample for Italy was taken, on similar lines, by Professor Livi,[2] supplemented by a rather larger sample, referring to Rome only, taken by Professor Lehner.[3]

The method of international comparison was to prepare a "standard table" showing the degree of occupational inheritance among men marrying in Indianapolis in 1938–41 and then to compare this with other American figures, and with figures for other countries (Table XIII).

In the first, or standard table, as we look down the diagonal, we see quite a strongly marked tendency for sons to be of the same occupational type as their fathers, or at any rate not too many stages removed from it.

Our first comparison with this standard is the table for men marrying in Indianapolis in the years 1905–12. At that date, for any given father's occupation, there was a considerably greater probability of the son becoming a skilled craftsman than there is now, a somewhat greater

[1] Brosard, *Population*, July-September 1950.
[2] *Population*, January-March 1950.
[3] World Population Conference, 1954.

Absolute Figures.
FRANCE, 1949

	Rural Wage-earners	Peasants	Urban Manual Workers	Clerical and Sales	Retailers and Artisans	Teachers, etc.	Professions	TOTAL
…rners	43	14	25	9	7	2	..	100
	11	63	10	7	6	1	1	100

Differences from standard, France

…workers	+7	+3	-15	+4	+2	-2	0	..
…sales	+4	+3	-12	+2	+3	+2	-1	..
…rtisans	+2	+8	-23	-14	+28	+1	0	..
	+1	+14	-31	+2	+6	+9	+3	..
	0	+9	-18	-20	+10	+8	+10	..

…dard.

Executives, etc.	Professions
-5	-2
-6	-1
-2	+2
15	+14
+2	+18

probability of his becoming an unskilled labourer, and a much smaller probability of his becoming a semi-skilled worker. This is nothing but a reflection of the external fact that modern industry demands many more semi-skilled men, fewer genuine craftsmen or labourers.

After discounting this predominant fact, we see that the number of sons rising to considerably better-paid and better-skilled occupations than their fathers in 1912 was generally less than in 1938–41 ; but the differences were not as marked as might have been expected.

The table for coloured men is disquieting. The great majority had to become unskilled labourers. This applied even in the case where the father had achieved a better social position.

When the figures for San José are compared with those for Indianapolis, we find considerably greater proportions of sons becoming proprietors, managers and professional men, and also a higher proportion of unskilled labourers. This may be due to a quite different occupational structure in the town, or to an unrepresentative sample.

The table for Great Britain also shows comparatively fewer sons entering semi-skilled occupations ; in this respect the industrial structure of present-day Britain probably bears some resemblance to that of the U.S.A. of 1905. The negative figure in this column is counter-balanced by positive figures in a number of other columns, not by any marked concentration of positive figures in any one. But the outstanding feature of the British table is that the sons of proprietors, managers and professional men show much less probability of becoming manual workers than do their American counterparts.

In France, the sample covered agricultural wage-earners and peasants, who were not covered by the British and American figures. The first two lines of the table therefore give the absolute figures of the occupational distribution of sons of rural wage-earners and peasants. In this case a very high degree of association between the sons' occupation and the fathers' is shown.

In the rest of the table it is seen that sons from all

types of families show much less tendency to become urban manual workers than in the U.S.A. and a much more marked tendency to become retailers and artisans. Here again, the result reflects the different external circumstances in France. But also, as in Britain, there is a tendency for fewer sons of professional men and proprietors to become manual workers, clerks or salesmen, than in the U.S.A. But at the same time, and this result may be found rather surprising, of the sons of French urban manual and clerical workers, a higher proportion succeeded in securing "social promotion" than in the U.S.A. This may reflect a better educational system in France.

In Italy rural workers and peasants are also included, grouped with the unskilled, although the special survey for Rome by definition excludes them. Generally speaking, the grouping of positive signs down the diagonal and negative signs in the corners of the table, indicates that Italy is a society of much greater hereditary stratification than any of the other countries examined.

A man's occupation and financial success naturally bear some relation to the education which he has received; though it is not found that this relationship can be specified statistically. A sample of the whole male population of the U.S.A. between the ages of 25 and 44 in 1946[1] showed the following median incomes in dollars:

TABLE XIV

	$
Men with primary schooling only:	
Less than 7 years	1630
7 or 8 years	2190
High School education:	
1-3 years	2264
4 years	2410
College education	3029
All men	2296

[1] Published in *Current Population Returns*, Series P60, No. 3, June 1948.

Tables prepared in this way are sometimes used as crude propaganda for reluctant students, to explain that "education means dollars". While deprecating such an approach we should not ignore the important element of truth in it. These sample surveys in which some income data are collected (now apparently abandoned) were found to err systematically in respect of a general understatement of the higher incomes; and this defect probably affects this table. The effect of education upon income may be greater than the table shows.

A more interesting table (Table XV), compiled from the U.S. Census for 1940, shows the median number of years of education of various occupational groups, and how this has changed for men born in each succeeding decennium. Farmers and farm labourers appear to make do with less formal education. The professional man has required sixteen years of education throughout, while the educational requirements of the other groups have been gradually rising. To some degree this reflects no more than compulsory extensions to the school age, now in force in an increasing number of States, from which farm children are probably exempt. But, subject to this measure of compulsion, it seems clear that the men with less education tend to move into certain occupational groups.

An international comparison of the number of university students per thousand of population in various countries was prepared by Dr. Idenburg of the Netherlands Bureau of Statistics in 1934.[1] The figures from Table XVI are from this source, except where otherwise indicated. Unfortunately, no comparable information appears to be available to bring it up to date.

The striking result emerges that England has the lowest university population in the world, and America the highest. Other high populations are found in Austria, Lithuania and Czechoslovakia.

There seems to be little doubt that lack of education — technical, secondary and university — has held back economic progress in Great Britain, and that abundance of

[1] *Journal de la Société des Statistiques de Paris*, 1934.

TABLE XV

MEDIAN NUMBER OF YEARS' EDUCATION OF VARIOUS OCCUPATIONAL CLASSES

(U.S.A. 1940 Census)

Date of Birth	Professional and Semi-professional	Farmers and Farm Managers	Proprietors, Managers and Officials (Non-farm)	Clerical, Sales and Kindred Workers	Craftsmen, Foremen and Kindred Workers	Operatives and Kindred Workers	Personal Service Workers	Farm Labourers and Foremen	Labourers, Except Farm and Mine
White Males (native born):									
1875–1884	16·0	7·2	8·5	10·3	7·6	7·2	7·5	6·5	7·0
1885–1894	16·0	7·3	9·5	10·5	7·7	7·2	7·7	6·8	7·1
1895–1904	16·0	7·5	11·5	11·5	8·2	7·8	8·1	7·2	7·4
1905–1909	16·0	7·9	11·8	11·8	9·2	8·5	9·2	7·5	7·9
1910–1914	16·0	8·1	12·0	12·1	10·3	9·0	10·3	7·7	8·0
1915–1917	..	..	..	12·0	11·5	10·4	10·6	8·0	9·6
1918–1919	..	..	..	..	..	12·2	10·9	8·1	10·0
1920–1921	..	..	..	..	..	..	..	8·0	9·5

education is an important factor in the economic welfare of the U.S.A.

TABLE XVI

	1910	1913	1925	1930	1932
U.S.A.* . .	..	4·21 †	..	88	..
England and Wales	..	..	1·07	.	1·214
Germany . .	1·113	1·15 *	1·416	.	1·97 *
France . . .	1·040	..	1·436	.	1·881
Holland . .	0·799	0·81 *	1·273	.	1·57 *
Sweden . .	1·019	1·16 *	1·453	.	1·84*
Spain . . .	0·803	..	1·408	.	1·516
Norway . .	0·896	..	1·645	..	1·655
Austria . .	1·273	..	3·157	..	3·615
Belgium . .	1·065	..	1·147	.	1·398
Italy . . .	0·774	..	1·136	.	1·226
Czechoslovakia .	..	..	2·036	.	2·325
Hungary . .	0·671	0·97 *	1·913	.	1·83 *
Greece * .	..	0·68	..	.	1·29
Roumania * .	..	0·68	1·97	.	..
Lithuania * . .	..	..	..	.	4·47

International Labour Review, vol. xxxiii, p. 305. † 1915.

The extent to which universities promote social mobility and reduce the stratification of society depends upon the extent to which they are, in fact, open to the children of the less wealthy classes. An article by Mlle Leplae, in the *Bulletin of the Institute of Economic and Social Research* of Louvain University (December 1946), analyses the position in Louvain University and quotes similar analyses for some other universities.

PARENTAGE OF STUDENTS AT LOUVAIN UNIVERSITY
(Percentage Distribution)

Agriculturists . . .	13
Army	2
Medical and pharmacy .	8
Commerce	22
Teaching	7
Salaried and public servants	21
Industry	20
Law	7

Comparing this with the industrial distribution of the occupied population of Belgium, this indicates a fair degree of inter-class mobility, though agriculture and manufacture provide a proportionately small, and the professions a proportionately large, share of the students. Mlle Leplae made a further analysis of the parentage of students in the different faculties and found that, on the whole, there were no marked differences in the parentage-analysis for the different studies. The outstanding occupation was the study of *Notariat* (study for solicitor's qualifications, a separate faculty from *Droit*, or qualifications for barristers). In this faculty 53 per cent of the students were themselves the children of *Notaires*. In the medical faculty, on the other hand, only 11 per cent were the children of doctors.

Mlle Leplae also made a careful analysis of the success in examinations attained by the children of different parents, and found no very significant difference with the outstanding exception that the children of university professors scored on the average 34 per cent above the normal. It remains to be determined whether hereditary or environmental factors were at work.

In the Netherlands a somewhat larger share of the university places were taken by children of professional men as shown by official inquiry in 1936–37 :

Industry and commerce	37·1
Salaried and public service	19·2
Teachers . . .	14·1
Other intellectual professions	19·3
Indeterminate and miscellaneous	10·3

The parentage of 1653 students at the University of Baden between 1898 and 1921 included 8 per cent teachers, 15 per cent salaried and public servants, 6 per cent artisans and virtually no children of lower-paid wage-earners. Nearly all the remainder appear to have been children of professional and business men. In the University of Leipzig, between 1871 and 1911, over half the students were the children of teachers, lower-paid salary-earners, artisans, wage-earners and peasants.

A recent French study[1] of a sample of boys who entered *lycées* in 1942–46 showed the distribution of the boys' fathers as follows:

	Per Cent
Peasants	9
Urban manual workers	12
Proprietors of businesses	25
Salaried men in private businesses	18
Salaried men in Civil Service	26
Professional men	7
Pensioners	3

Entry into the *lycées*, it appears, is not frequently obtained by the sons of peasants or manual workers. It should be pointed out, however, that while the *lycée* is the avenue to professional and Civil Service employment, it is not so, generally, to success in business.

An interesting study in Sweden[2] shows the parentage of students "matriculating" in Sweden on three successive dates. This examination is taken at various ages between 18 and 20 upon completion of a fairly strenuous secondary schooling (like the French *Baccalauréat*) and is the avenue to success in the professions and salaried work.

TABLE XVII

PERCENTAGE DISTRIBUTION OF PARENTAGE OF STUDENTS MATRICULATING IN SWEDEN

	1910	1930	1943
Higher proprietors and officials, university graduates	34	36	32
Farmers, men with secondary education	48	41	44
Men with primary education only	17	22	22
Unknown	1	1	2

In Sweden also it appears that the change in social mobility during the last generation has not been as great as is sometimes supposed.

[1] *Population*, January-March 1951.
[2] Moberg, *Population Studies*, June 1950.

Monsieur Bresard's article[1] gives further details of his survey, which are of great interest to anyone concerned with the mechanics of social promotion in modern France. For succeeding generations, he demonstrates a "fan" whereby a man's occupation shows a considerable correlation with that of his father, almost as much with that of his father-in-law, less with that of his paternal grandfather and very little with that of his maternal grandfather.

He also submits to statistical testing the famous doctrine of "la capillarité sociale", first advanced by Arsène Dumont in the 1890s. According to this doctrine, the children of large families were less likely, other things being equal, to achieve success in business or promotion in the Civil Service than the children of small families; and this consideration provided the principal incentive to the limitation of families in France. This interesting hypothesis was found to have an element of truth in it, but less than is generally supposed. The average number of years' schooling received by sons depended mainly upon the occupation of the father and was only slightly affected by the size of the family. In the case of larger business proprietors and professional men, the children of large families actually received more education than the children of small families.

Among the larger business and professional men it would seem that not only do the children of larger families receive more education, but also seem to have on the average more successful careers. In the second group, however, the reverse is the case. Sons of small families have a better chance of following their father's occupation. For retailers and small business men there is no great difference; but the difference is again very marked for peasants. It is indeed a commonplace of French sociology that the chance of inheriting his father's farm is much greater for the son of a small family. In a large family a much larger proportion of the sons become wage-workers. Neither in the large nor in the small families do any

[1] *Population*, July-September 1950.

TABLE XVIII

Proportion of Sons found in Occupations Specified

Occupation of Father	Average No. of Years Schooling received by Sons, all Sizes of Family	Average No. of Years Schooling received by Sons, Families of 4 or more	Sons in Families of 1 or 2 Children							Sons in Families of 3 or more Children						
			Larger Business Proprietors, Professional Men	Administrative Civil Servants, Business Executives	Retailers and Small Business Men	Peasants	Clerical Workers, Business and Civil Servants	Urban Wage-workers	Rural Wage-workers	Larger Business Proprietors, Professional Men	Administrative Civil Servants, Business Executives	Retailers and Small Business Men	Peasants	Clerical Workers, Business and Civil Servants	Urban Wage-workers	Rural Wage-workers
Larger business proprietors, professional men . .	13·0	14·0	35	16	19	9	16	5	..	45	20	18	8	4	6	..
Administrative Civil servants, business executives . .	13·1	12·8	13	38	11	11	16	11	..	14	17	12	15	28	12	2
Retailers and small business men	9·1	8·5	4	7	48	9	18	13	1	6	4	43	8	17	20	3
Peasants	7·5	7·3	1	2	6	70	8	6	7	..	1	6	59	7	13	14
Clerical workers, business and Civil servants . .	10·4	9·5	6	12	10	3	46	21	3	5	8	10	3	38	31	5
Urban wage-workers . .	8·0	7·3	2	3	11	2	25	54	4	2	2	8	4	18	55	9
Rural wage-workers . .	7·0	6·8	..	1	16	10	11	24	37	..	2	4	16	8	25	45

substantial proportion of peasants' sons aspire to the more educated occupations.

Among the sons of clerical workers, the proportion who become manual workers is considerably higher in large families. But the converse does not hold ; the proportion who become business executives or professional men is not appreciably higher for the small families than it is for the large.

For urban wage-workers also there is little difference. As regards the children of rural wage-workers, we get the interesting result that the children of large families definitely have a better chance of becoming independent peasant proprietors, but a worse chance of becoming retailers or small business men.

It appears that the famous generalisation about social capillarity, now at any rate, applies to certain sections of the population only.

Herr Moberg [1] classified the Swedish figures in another way. He showed that entrants for matriculation, who were the sons of manual workers who had not received a secondary education themselves, came from considerably smaller families, on the average, than the sons of business and salaried men and farmers. He went on to show that such men also tended to bring up families rather smaller than the average themselves. It is not likely that this represents an inherited biological tendency towards infertility, and so far as it represents a " social inheritance " it is a diminishing one. Men born from manual working families who matriculated in 1920 show a difference from the national average in the size of family which they brought up considerably less than did their predecessors a decade earlier. There has been a tendency towards late marriage among Swedish men, which was most marked in the generation born about 1900, and a tendency for educated men to marry later still. But both these tendencies are disappearing in the present generation.

Signor Lehner also classified his data, for Rome in 1954, according to the number of children of the family

[1] *Population Studies*, June 1950.

into which the son was born. For most of the population of Rome, size of family does not appear to make much difference to occupational prospects; but it makes a very marked difference to the sons of the proprietors of medium and large businesses and professional men.

Finally, some comment may be made on the educational situation in India. It has long been suspected that

SALARIES ATTACHED TO VARIOUS POSTS
(Rupees per Month)

Clerical	19
Proof-reader, midwife, compounder, tracer	20
Drill and drawing teacher, vaccinator	25
Civil Service clerk (B.A. degree required), manual training instructor, weaving instructor, librarian, borer, water-works fitter	30
Electrical foreman	40
Vulcaniser	45
High School teacher (B.A. degree required), sanitary inspector, draughtsman, overseer, cinema operator	50
Agricultural demonstrator (Bachelor of Agriculture degree required)	60
Electrical engineering, engineering supervisor (Bachelor of Engineering degree required)	70
Metallurgist (Bachelor of Science degree required), lecturer in economics (M.A. degree required)	100
Bleacher (M.Sc. degree required), assistant aerodrome officer, expert tanner	200
Oilseed specialist, fruit-canning expert	250
Poultry research officer	275
Mycologist	325
Medical statistician	375
Wool expert	400
Actuary	1000

Indian schools and universities provided literary education in excess of the country's needs, scientific and technical education in defect. A revelation of how completely distorted the position has become is given in a short analysis published by *Sankhya*, September 1939, classifying the salaries of all posts advertised in the press in Madras over a short period. The range of salaries offered is in the ratio

of 50 : 1, whereas in many countries the ratio for the highest to the lowest income for this same range of occupations would be 5 : 1, or even less. It must also be borne in mind that an unskilled labourer in the large cities was paid 20 rupees a month, and the most skilled manual workers over 60 rupees a month (pre-1939).

The over-supply of one type of education and the under-supply of another is all too clearly visible.

CHAPTER XI

CAPITAL RESOURCES AND THEIR ACCUMULATION

UNTIL about the beginning of the present century the study of national wealth received much more attention from economic statisticians than the study of national income. Indeed, many of the studies of national incomes which were made during this period were prepared as sequels, and indeed as by-products, of studies of national wealth.

Why there should have been this preference for national wealth studies from the past with a complete change-over of emphasis in the present century to national income studies, to a point where national wealth studies are virtually neglected, might be a fruitful subject for historical speculation. It might be added that many of these early studies were of extremely poor quality and showed a persistent tendency to exaggerate, possibly from the mistaken belief that a statistician might help to glorify his country thereby. In 1871, when Bismarck demanded from France a war indemnity of £200 millions and the French negotiators claimed that it was beyond their means, Bismarck (no doubt with some good Civil Service staff work behind him) promptly quoted all the most exaggerated estimates of national wealth recently prepared by French statisticians. This episode may have done something to raise the standards of statistical accuracy.

Without going into other reasons which historians may offer for this change of emphasis among statisticians, it may at any rate be pointed out that the value of land, as can be seen from Table I, stood at a much higher level in the past, relative to other elements in the national economy, than it does now. The doctrine of the physiocrats only died slowly, and even in the nineteenth century economists may have found it difficult to

distinguish clearly between land and other forms of wealth.

Our definition of capital, for our present purpose, should be reproducible wealth used for purposes of production. What constitutes production should be defined in the same way here as it is in defining national product. For reasons given previously, the use of a dwelling is treated as part of the national product, and the dwelling therefore constitutes capital; but the use of furniture, private motor cars, etc. ("stock of consumer durables" in modern parlance), when in the hands of ordinary householders, is not regarded as an element in national product, nor are these goods therefore regarded as capital. (The comparatively small quantities of furniture, etc. used for business purposes are, however, included in capital.) When we are measuring the capital of any country, we measure the capital physically present in that country, whether or not it is owned by citizens of another country; and conversely we exclude (though we try to give some indication of) the capital which any country's citizens hold outside its own borders.

The adjective "reproducible" should convey in a precise manner the sense that we wish to include all buildings, roads and other structures, equipment and stocks of goods, but that we wish to exclude all valuations of natural resources, not only agricultural and urban land, but also natural forests and minerals. We exclude urban land, which is not so much a natural resource as an economic value which arises out of a conjuncture with other people's economic activities. By the same token we should seek to exclude "good will" and similar forms of asset, if we do not always succeed in doing so.

The above reasoning indicates that clearly the best way of measuring capital is to make an inventory of physical assets. It is only recently that this task has been performed in a complete and satisfactory manner by Mr. R. W. Goldsmith for the U.S.[1] and then by Mr. Philip Redfern for the U.K.[2] Mr. Goldsmith's method did not

[1] Published in *Studies in Income and Wealth.*
[2] *Journal of the Royal Statistical Society,* Part I, 1955.

cover stocks of consumable and semi-finished goods, and raw materials, for which he relied upon other studies (which have been in progress for many years by the U.S. Department of Commerce). Mr. Redfern's study had to be supplemented by an estimate of stocks by the Central Statistical Office, prepared for the first time in 1952.

In both cases the method was to record new structures or equipment installed (i.e. production + imports − exports + installation costs) at various dates in the past, and allowing for depreciation and obsolescence to estimate their value at subsequent dates. It is assumed that enough has been spent on maintenance to keep each asset in good order until it is scrapped. The American study used "diminishing balance" depreciation rates; the British study "straight line" depreciation. The latter method involved studying the construction of new buildings (the most long-lived asset) back for 100 years. Other assets also last for fairly long periods. The American method, on the other hand, involves making a rather arbitrary assumption of the "opening stock" of capital in 1869, the year for which the study begins. This method can, however, be defended by pointing out that this "opening stock" depreciated after a few years represents only a very small proportion of the whole estimated national capital. This defence appears to be valid for a very rapidly growing economy, less so for a slowly growing economy, where Mr. Redfern's "straight line" depreciation may be more appropriate (it probably involves a good deal more arithmetic). To use Mr. Redfern's methods it is probably desirable to work throughout at the price-level of a single year (1948 in this particular case) while Mr. Goldsmith's method allows a little more flexibility in this respect.

Valuation of capital, it is clear, should be "depreciated replacement value". In other words, we should attempt to measure the asset at its original installation cost, allow for its depreciation in subsequent years, and then multiply by a factor representing the change in the price of a new construction of the type of building or equipment in question between the date of installation and the present

day. Only in the " inventory of assets " method can these requirements be properly met. Other methods of measuring capital hitherto in use fall short of it in various ways. In some cases capital assets are measured at their current market price. We can see that, in the long run, the market price of capital assets tends to move towards their " depreciated replacement value ", but it may take a long time. In a period when such assets are in excess of requirements, their market price may fall a long way below their real value; and conversely. Moreover, the market price of capital assets is greatly affected by legislative provisions, e.g. in the immediate post-war years the price of buildings might have been expected to rise above replacement value in any case, but legal restrictions upon new building allowed this difference to become much wider than it would otherwise have been; conversely, legal restrictions upon rents, maintained by some countries throughout the inter-war years, caused the market price of some dwellings to fall much below their replacement value. In some cases, particularly in statistics of manufacturing industry, capital estimates are sometimes prepared at original cost, adjusting each year for depreciation and new installations. This method gives reasonably accurate results at the end of a fairly long period of comparatively stable prices, but seriously distorts results during a period when there has been any strong upward or downward movement in the price-levels.

In other cases, unfortunately in most cases in the earlier years, capital was estimated by the still more doubtful method of capitalising income. Lord Stamp used this method for estimating British capital in 1928. This method is defensible, in very broad terms, for times and places where there is a really extensive free market for shares, partnerships, and other forms of claim upon wealth, and where a study of Stock Exchange information makes it possible to estimate with some precision the average yield of stock market assets. This method, however, like the estimation of the current market value of the physical assets, is affected by the slowness with which the market adjusts itself to any substantial change

in the general price-level; and has also an additional drawback of its own, in that stock market values are liable to be greatly upset by short-period movements in the rate of interest. In other words, this method can only hope to be reliable at the end of a fairly long period in which not only the general price-level but also the rate of interest has remained comparatively stable.

Subject to these considerations, we can now examine the data as set out in Table I. The reader will have been prepared for the anomaly of finding a limited number of studies of high accuracy for modern times, a considerable number of nineteenth-century studies and comparatively little in between.

To reduce all data to a single unit of measurement we use the device of expressing each item of capital as a multiple of the net national product. We have to make the choice between measuring this latter at market prices and at factor cost and we must choose the former or the latter according to whether we assume that indirect taxes do or do not affect the price of capital goods. Neither assumption is entirely accurate, but the former appears preferable; however, the difference involved is small in relation to the uncertainties in the capital figures. In a few cases this method of measurement is not practical, and capital has to be stated in various currencies or in I.U. per head of population.

Hitherto, the general impression had been that the order of magnitude of reproducible capital in most countries was about 4 years' national product. Further examination of the data has shown us that, in a number of advanced countries, capital stock equivalent to 3 or $2\frac{1}{2}$ years' national product will suffice, but that for others such as Norway and Australia a much higher ratio appears to be required. Much more interesting is the tendency, clearly marked in a number of countries, for the ratio of capital requirement to income to have risen to a maximum about a generation ago and now to be fairly rapidly declining. In some cases this can be explained by railways, and other particularly expensive forms of capital equipment, being comparatively

under-utilised in their early years and more fully utilised later. But this hypothesis not always substantiated when we examine the actual capital requirement for railways. It seems better to hypothecate a more general case of increasing returns, whereby a whole complex of different forms of capital may be more economically utilised, once national product has reached a certain level, than it could be previously. But also, quite apart from this, it seems to be necessary to hypothecate "capital savings inventions",[1] in which technical progress makes it possible to obtain a given output not only with the use of less labour but also with the use of less capital than the old technique required. Some economists have become so wedded to the idea of capital substituted for labour that they find it impossible to envisage such "capital saving inventions". Probably the biggest single capital saving in the modern world has arisen out of the combination of road transport and telephonic communication, whereby traders and manufacturers can replenish their stocks much more rapidly than their predecessors did, and therefore have to carry much less stock in relation to output. Other examples are the higher speed of trains and ships, whereby a given vehicle can carry a much larger quantity of traffic in the course of a year; beam radio and the co-axial cable, whereby a given expenditure on equipment can carry a greatly increased quantity of telephonic and telegraphic communications; and the articulated vehicle in road transport, whereby an engine is coupled up to a free vehicle as soon as its journey is ended and can thereby cover a far greater mileage per year when it does not have to stand idle during loading and unloading periods. Any competent industrial engineer will always say that his job, in re-designing equipment, is to get a greater output from a given capital expenditure and very often, it appears, he succeeds.

The fall in the ratio of capital value of dwellings to the national product is interesting. This may be explained

[1] "During last 25 years output of a cellophane casting machine has increased 6-fold, output per man-hour 15-fold, and pounds produced per $ of investment have been increased 7-fold." Mr. Crawford Greenewalt (President of Du Ponts), *Fortune*, May 1955.

partly by a change in taste (in the 1890s it was customary for the financially successful man to express himself by building as large and ugly a house as he could) but probably by strictly economic factors — the growth of the motor car and other alternative claimants upon family expenditure, and the rapid rise in the relative price of domestic services, which has made a large house a much less attractive asset than it used to be. In many countries this coefficient is now less than 1. The practical maxim probably still remains true, that a prudent man may purchase a house at a price equivalent to two years' income, but not more; but it must be remembered that only a comparatively small minority of families purchase or dwell in new houses, and the great majority are willing to dwell in old houses, at various stages of economic depreciation.

In any case, as has already been shown, the price of building shows a strong and persistent tendency to rise relative to the price of everything else, mainly because of the relatively slow improvement of efficiency in the building trades. This factor naturally discourages the demand for dwellings and also probably for commercial buildings, though we do not have such precise information here. Generally speaking, in the total of national capital, structures are tending to become relatively less important, equipment relatively more important. On stocks little information is available, but we may expect the proportion to decline.

Agricultural capital is clearly of considerable relative importance in a country where a large proportion of the labour force is still occupied in agriculture, but forms a low proportion in advanced countries. Both railway and public authority capital may be expected to stand at a fairly high ratio to national product in a new and sparsely populated country.

The high ratio of land values to national product in the early stages, and the rapidity of their decline, are of course a measure of the growth of the rents available from land, expressed as a proportion of national income, which will be the subject of further analysis in the following chapter.

[*contd. on p.* 580

TABLE I

Capital Expressed as Multiple

Country	Date	Currency Unit	Net National Product at Market Price	Total	Classified by Nature			Classified by Use				
					Structures	Equipment	Stocks	Dwellings	Agriculture	Railways	Manufacture	Mining
Africa (excl. S. Africa and Egypt)	1900	..	..	6 [a]	..	..	..	..	..	..	..	..
	1914	..	..	19 [a]	..	..	..	..	..	..	..	..
	1936	..	..	30 [a]	..	..	..	..	..	9 [a]	..	..
Argentine .	1916	b. peso	5·21	1·59	0·56	..	..	..	0·14	0·28	..	..
	1940	,,	8·11	..	..	0·37	..	..	..	..	..	..
Australia .	1890 [b]	£ m.	65·6	4·02	..	0·14 [d]	0·33	2·02	0·50 [c]	0·66 [e]	..	..
	1903	I.U. m.	1370	4·11	..	0·33 [g]	0·33 [g]	1·91 [g]	0·63 [g]	..	..	..
	1915	,,	1869	4·33	1·93 [f]	..	..	..	0·36 [f]	..	..	..
	1929	,,	3151	4·01	4·01	..	..	..	..	..	..	..
	1942	,,	3902	4·37	..	..	..	..	..	..	..	..
	1949	,,	5270	3·67	..	..	..	..	..	0·57	..	..
Austria .	1907	b. kr.	15·2 [h]	3·80	0·99	..	..	..	..	0·69	..	..
Belgium .	1914	b. frs.	7·45	2·72	0·79	..	..	..	..	..	..	..
Bolivia .	1940	..	..	..	..	31 [i]	..	..	..	..	..	..
Brazil .	1940	b. cruz.	35·9	2·50 [v]	..	1·22	..	..	..	..	2·32 [v]	..
Bulgaria .	1938	b. leva	56	..	0·09 [l]	..	..	..	..	..	..	..
Canada .	1901	$ b.	1·1	..	..	..	..	..	1·16	0·69	0·52	..
	1911	,,	2·5	..	..	..	..	..	0·68	0·60	0·54	..
	1914	,,	3·0	2·59	1·00	..	..	..	0·30	0·37	..	..
	1929	,,	5·73	3·76	1·10	..	..	..	..	0·64	0·72	..
Chile . .	1940	b. peso	18·0	..	..	0·92	..	..	..	..	..	..
	1950	,,	..	1·90 [vx]	..	..	..	..	2·57 [v]	5·00 [vw]	1·60 [v]	1·12 [v]
China .	1930	..	..	..	..	..	..	..	..	..	..	..
Colombia .	1940	b. peso	1·11	..	..	0·65	..	..	..	..	..	..
Costa Rica .	1940	..	..	..	..	31 [i]	..	..	..	..	..	..
Cuba . .	1940	b. peso	0·55	..	..	0·36	..	..	..	..	..	..
Denmark [o] .	1880	m. kr.	700	4·49	1·61	..	..	..	0·82	0·16	..	..
Dominican Republic .	1940	..	..	..	..	30 [i]	..	..	..	..	..	..
Ecuador .	1940	..	..	..	..	35 [i]	..	..	..	..	..	..
Egypt .	1939	m. £E	168	3·22	1·11	..	..	1·01	0·69	0·18	..	..
El Salvador	1940	..	..	..	..	29 [i]	..	..	..	..	..	..
Finland .	1890	m. mk.	1100	..	1·35 [s]	0·09 [r]	0·16	..	0·20 [q]	..	..	..
Formosa .	1939	..	..	..	..	..	..	..	..	..	260 [u]	..
France .	1789	md. frs.	3·6	..	..	..	..	..	..	..	..	..
	1812–15	,, [*]	6·2	..	..	..	..	..	..	..	..	..
	1851–53	,,	12·0	..	1·68	0·58	..	1·56	0·24 [t]	..	..	..
	1869	,,	16·8	..	..	1·29	..	..	..	..	..	..
	1880	,,	20·1	..	2·29	2·15	..	2·06	0·29 [t]	..	..	..
	1893	,,	25·4	3·94	2·16	..	..	1·93	0·39	..	..	..
	1913	,,	36·1	4·79	1·79	1·94	..	..	0·28	..	..	..
	1924	,,	188	..	..	1·33	..	..	..	..	..	..
	1929	,,	300	..	0·85	..	..	..	0·14	..	..	..

Public Authorities Capital (inc. in previous columns)	Not included in previous columns: Foreign Assets	Agricultural Land	Urban Land	Non-Income yielding Consumer Durables	National Debt	Capital in I.U. per Person engaged in Industry in Question: Agriculture (ex. Land)	Manufacture	Source
..	..	..	..	..	..	..	..	Frankel, *Capital Investment in Africa*
..	..	..	..	..	..	..	..	,, ,,
..	..	..	..	..	..	..	..	,, ,,
..	..	0·88		0·14	..	..	..	Bungo (quoted Stamp, *J.R.S.S.*, 1919)
..	..	..		..	..	..	..	Inter-American Development Comm.
1·03	..	4·41		0·31	..	..	..	Coghlan, *Wealth and Progress of N.S.W.*
1·27	..	3·30 [g]		..	..	..	..	*Economic News* (Brisbane), May 1950
1·37	..	..		..	..	..	..	
1·40	..	..	..	..	..	..	..	
1·52	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	
..	..	1·91		..	..	..	..	Fellner (quoted Stamp, *J.R.S.S.*, 1919)
..	..	0·90		0·40	..	..	..	Official (quoted Stamp, *J.R.S.S.*, 1919)
..	..	..	..	..	..	..	5300 [j]	Inter-American Development Comm.
..	..	..	..	..	..	..	465 [k]	,, ,,
..	..	..	..	..	..	..	..	Larmer, *Weltwirtschaftliches Archiv*, Nov. 1938
..	..	..	..	..	..	..	..	Coates Report
..	..	..	..	..	..	..	..	,, ,,
..	..	1·11		..	..	..	..	Bankers' Association (quoted Stamp *J.R.S.S.*, 1919)
..	..	..	..	0·25	..	..	..	*Year Book*
..	..	..	..	..	..	..	800 [n]	Inter-American Development Comm.
..	..	..	..	..	..	..	..	,, ,,
..	..	..	..	..	..	362 [m]	..	Remer, *Weltwirtschaftliches Archiv*, July 1936
..	..	..	..	..	..	..	..	Inter-American Development Comm.
..	..	..	..	..	..	..	..	,, ,,
..	..	..	..	..	..	..	..	,, ,,
..	..	3·45	..	..	..	..	..	De Foville, *J.R.S.S.*, 1893
..	..	..	..	..	..	..	..	Inter-American Development Comm.
..	..	..	..	..	..	..	..	,, ,,
0·83 [p]	..	3·93		..	..	350	4860	Issawi, *Egypt at Mid Century*
..	..	..	..	..	..	..	..	Inter-American Development Comm.
..	..	..	..	0·28	..	..	..	Frederiksen, *Finland*
..	..	..	..	..	..	..	..	*Oriental Economist*
..	..	8·32		..	..	..	..	Simiand, *Le Salaire*, vol. iii, pp. 75, 95-7
..	..	6·45		..	..	..	..	,, ,,
..	0·25	5·32		..	..	..	..	,, ,,
..	0·65	..		..	..	..	..	,, ,,
..	0·67	4·56		..	..	..	..	,, ,,
..	0·79	3·55		..	1·18	..	..	De Foville, *Dictionnaire des Finances*
..	1·02	1·94		0·11	0·56	..	..	Stamp, *J.R.S.S.*, 1919
..	0·47	0·97		..	..	..	..	Simiand
..	..	0·89		..	..	..	..	Michel, *Jour. de la Soc. de Statistique de Paris*, 1930

[contd. overleaf. Notes on pages 578-80

TABLE I (*contd.*)

CAPITAL EXPRESSED AS MULTIPLE

Country	Date	Currency Unit	Net National Product at Market Price	Total	Classified by Nature			Classified by Use				
					Structures	Equipment	Stocks	Dwellings	Agriculture	Railways	Manufacture	Minin
Germany .	1913 [a]	md. mk.	52·5	4·23	..	..	..	..	..	0·43	..	..
	1936	,,	..	..	..	..	..	..	..	..	2·39 [r]	..
	1952	md. Dm.	114	..	..	..	..	0·73	..	..	..	..
Greece .	1891	m. dr.	800	3·56	3·34	..	..	..	..	..	..	..
Guatemala .	1940	..	..	..	..	27 [b]	..	..	..	..	..	..
Haiti . .	1940	..	..	..	..	17 [b]	..	..	..	..	..	..
Honduras .	1940	..	..	..	..	18 [b]	..	..	..	..	..	..
Hungary .	1890	b. kr.	6·0	0·63	0·18	..	..	..	..	..	..	..
	1912	b. pengo	8·3	4·18	1·20	2·17	..	..	..	0·81 [c]	..	..
1912, Post-war boundaries . .		,,	3·3	4·60	1·59	2·35	..	..	..	0·75 [c]	..	..
	1928	,,	6·68	3·45	1·22	1·79	..	..	..	0·44 [c]	..	..
	1938	,,	6·72	5·58	..	..	..	1·53	..	0·94 [c]	0·83	..
Iraq . .	1939	..	..	..	..	..	..	..	..	17 [e]	..	..
Ireland .	1880	£ m.	86	2·55	..	..	..	0·46	0·93	0·42	..	..
Israel .	1939	..	..	615 [e]	335 [e]	..	..	..	115 [f]	17 [e]	95 [e]	70 [e]
Italy . .	1874–1878 [l]	md. l.	7·8 [h]	..	..	2·26 [h]	..	..	..	..	..	..
	1879–83	,,	8·6 [g]	..	..	2·26 [h]	..	..	..	..	..	..
	1884–89	,,	9·6 [g]	..	..	2·26 [h]	..	..	..	..	..	..
	1901–5	,,	14·6	..	..	2·09 [h]	..	..	..	..	0·17 [i]	..
	1914	,,	21·6	2·43	0·92	..	..	..	0·23 [j]	..	..	..
	1928 [l]	,,	133·8	1·86	0·60	..	..	..	0·20 [j]	..	..	..
Japan .	1877	b. yen	0·58	..	..	..	..	..	..	..	0·04 [n]	..
	1893	,,	1·4	..	..	..	..	..	..	..	0·21 [n]	..
	1905	,,	2·8	5·09	..	..	..	..	..	..	0·36 [n]	..
	1913	,,	7·25	4·90	..	..	..	..	..	..	0·40 [n]	..
	1919	,,	5·15	8·48	..	..	..	..	..	..	0·58 [n]	..
	1924	,,	8·7	7·76	..	..	..	..	..	..	0·79 [n]	..
	1930	,,	13·0 [m]	5·31	1·82	1·22	1·45	..	0·54 [o]	0·28	..	..
Jugoslavia .	1938	b. dinar	51·5	..	..	..	..	..	..	..	0·31	..
Korea .	1939	..	..	..	..	..	..	..	..	..	270 [p]	..
Manchuria .	1939	..	..	..	..	..	..	..	..	..	312 [p]	..
Mexico .	1940	..	..	2·10 [aa]	..	60 [b]	..	..	..	..	..	..
Netherlands	1893	b. guilder	1·6	6·21	1·22	..	..	..	..	..	..	..
	1915	,,	3·24	3·75 [q]	..	..	..	..	..	..	..	..
	1927	,,	5·96	3·65 [q]	..	..	..	..	..	..	..	..
	1939	,,	5·74	3·31	..	..	0·43	0·78	0·35	0·07	..	..
New Zealand	1915	£ m.	65	..	..	..	..	..	..	..	0·27 [t]	..
	1929 [s]	,,	136	..	..	..	..	..	..	..	0·36 [t]	..
Nicaragua .	1940	..	..	..	..	28 [b]	..	..	..	..	..	..
Norway .	1884	b. kr.	0·45	3·07 [u]	1·12	..	..	..	0·29	0·07	..	..
	1939	,,	5·35	4·56 [u]	3·00	1·12	0·44	1·68	0·36	0·18	0·84	..
Pakistan [w] .	1949	..		..	..	..	..	0·77	0·44 [x]	..	..	..

Public Authorities Capital (inc. in previous columns)	Not included in previous columns					Capital in I.U. per Person engaged in Industry in Question		Source
	Foreign Assets	Agricultural Land	Urban Land	Non-Income yielding Consumer Durables	National Debt	Agriculture (ex. Land)	Manufacture	
0·15	0·39	..	1·36	0·47	..	..	..	Helfferich
..	..	..	..	..	..	..	..	,,
..	..	..	..	..	..	..	..	*Vierteljahrsheft zür Wirtschaftsforschung*, 1953
..	..	2·92	..	..	0·16	..	..	De Foville, *J.R.S.S.*, 1893
..	..	..	..	..	..	..	..	Inter-American Development Comm.
..	..	..	..	..	..	..	..	,, ,,
..	..	..	..	..	..	..	..	,, ,,
..	..	1·09	..	..	..	..	..	De Foville, *Dictionnaire des Finances*
..	..	..	2·76	..	..	..	..	De Fellner, I.S.I., XXIVth Session
..	..	..	2·54	..	..	..	..	,, ,,
..	..	..	1·69	..	..	..	..	,, ,,
..	..	..	2·56 [d]	..	..	..	..	Int. Ref. Service (U.S. Dept. of Commerce), Dec. 1947
..	..	..	..	..	..	f	..	Bonné, *Econ. Dev. of the Middle East*
..	..	..	1·86	0·23	..	..	..	Giffen, *Econ. Inquiries and Studies*
..	..	..	..	..	..	..	..	,, ,,
..	..	..	3·45 [k]	..	..	..	..	Pantaleoni, quoted by de Foville, *J.R.S.S.*, 1893
..	..	..	3·45 [k]	..	..	..	..	,, ,,
..	..	..	3·45 [k]	..	..	..	..	,, ,,
.	..	..	1·99	..	..	..	..	Bolton King, *J.R.S.S.*, 1903
..	..	..	2·07	0·46	0·30	..	..	Gini, I.S.I., XIXth Session
..	..	..	1·16	0·34	0·29	..	..	,, ,,
..	..	..	..	..	..	..	..	Uyehara, *Industry and Trade of Japan*
..	..	..	..	..	..	..	..	,, ,,
..	..	..	3·00	..	..	..	..	Mori, I.S.I., XIXth Session
..	..	..	2·76	..	..	..	..	Shiomi Kyoto, *Economic Review*, 1934
..	..	..	3·76	..	..	..	..	,, ,,
..	..	..	2·51	..	..	..	..	,, ,,
..	..	..	3·15	..	..	..	..	,, ,,
..	..	..	..	..	..	..	..	Larmer, *Weltwirtschaftliches Archiv*, Nov. 1938
..	..	..	..	..	..	..	..	*Oriental Economist*
..	..	..	..	..	..	..	..	,,
..	..	..	..	..	..	..	960 [z]	Inter-American Development Comm.
..	..	..	1·63	..	..	..	..	De Foville, *Dictionnaire des Finances*
..	..	..	..	..	..	..	..	Stuart, I.S.I., XIXth Session
..	..	..	..	..	..	..	..	,, ,,
..	1·48	..	0·43	0·87	..	..	..	Nat. Inst. of Econ. and Soc. Research, *Occasional Paper* X
..	..	..	..	..	..	..	..	Dr. Max Brown (unpub. communication)
..	..	..	..	..	..	..	..	,, ,,
..	..	..	..	..	..	..	..	Inter-American Development Comm.
..	0·27 [v]	1·61	..	..	..	..	..	De Foville, *J.R.S.S.*, 1893
0·33	..	0·56	..	0·74	..	..	..	*Nasjonalinntekten i Norge*
..	..	0·67 [v]	..	..	..	..	..	U.N. "Formulation and Economic Appraisal of Development Projects"

[*contd. overleaf. Notes on pages* 578-80

TABLE I (*contd.*)

Country	Date	Currency Unit	Net National Product at Market Price	Total	Classified by Nature			Classified by Use				
					Structures	Equipment	Stocks	Dwellings	Agriculture	Railways	Manufacture	Mining
Panama .	1940	..	..	..	..	28 [a]	..	..	..	..	..	..
Paraguay .	1940	..	..	..	..	36 [a]	..	..	..	..	..	..
Peru . .	1940	..	..	..	..	44 [a]	..	..	..	..	..	..
Portugal .	1913	m. esc.	480	..	..	..	..	..	..	0·31	0·42	..
Spain .	1914	b. peso	12	2·33	1·05	..	..	..	0·33	..	..	..
	1933	,,	25·8	..	..	..	..	..	..	0·19	0·94	..
Surinam .	1939	..	..	3·9 [b]	..	..	..	..	..	..	..	..
	1950	..	..	3·3 [b]	..	..	..	..	..	..	..	..
Sweden .	1885	b. kr.	1·07	4·14	1·42	..	..	..	0·55	0·42	..	..
	1908	,,	2·73	5·12 [d]	..	..	..	..	..	..	..	..
	1913	,,	2·93	4·93	1·63	..	..	..	0·34	0·31	..	..
Syria . .	1939	..	..	..	..	..	..	..	..	34 [e]	..	..
Turkey .	1939	..	..	..	..	..	..	..	..	37 [e]	..	..
Union of S. Africa .	1900	I.U. m.	600	1·87 [f]	..	..	..	..	..	..	..	..
	1914	,,	889	2·23 [f]	..	..	..	..	..	..	..	..
	1936	,,	1,977	1·43 [f]	..	..	..	..	..	0·45	..	..
United Kingdom [g]	1801	£ m.	300	6·00 [n]	..	..	..	..	..	..	..	..
	1811	,,	430	4·90 [n]	..	..	..	..	..	..	..	..
	1841	,,	450	8·90 [n]	..	..	..	..	..	..	..	..
	1858–89	,,	800	7·50 [n]	..	..	..	..	..	..	..	..
	1865	,,	900	3·07	1·15 [j]	..	..	..	0·58 [k]	0·46	..	..
	1875	,,	1,164	3·51	1·22 [j]	..	..	..	0·48 [k]	0·57	..	..
	1885	,,	1,207	4·04	1·60 [j]	..	..	..	0·37 [k]	0·77	..	..
	1895	,,	1,549	3·72	1·50 [j]	..	..	..	0·20 [k]	0·62	..	..
	1905	,,	1,971	3·84	1·54 [j]	..	..	..	0·15 [k]	0·53	..	..
	1909	,,	2,122	3·80	1·54 [j]	..	..	..	0·14 [k]	0·51	..	..
	1914	,,	2,450	3·40	1·36 [j]	..	..	..	0·14 [k]	0·47	..	..
	1928	,,	4,567	3·53 [l]	..	..	..	..	0·10 [k]	..	..	..
	1938	,,	10,920 [h]	2·68 [i]	1·71	0·47	..	0·85	..	0·37	..	..
	1953	,,	12,720 [h]	2·55 [i]	1·52	0·53	0·50	0·80	..	0·28	..	..
United States	1805	$ b.	0·7	0·77	..	..	0·23	0·14 [p]	0·47	..	..	..
	1850	,,	2·42	1·59	..	..	0·47	0·33 [p]	0·62	..	..	..
	1880	,,	8·81	2·54	1·45	0·34	0·75	0·56 [p]	0·50	..	2·01 [u]	..
	1890	,,	11·6	3·35	2·02	0·50	0·83	0·93 [p]	0·50	..	2·20 [u]	..
	1900	,,	15·3	3·32	2·24	0·43	0·65	1·04 [p]	0·59	..	2·51 [u]	..
	1912	,,	33·0	2·84	1·92	0·42	0·50	0·78 [p]	0·48	..	3·28 [uv]	..
	1922	,,	65·7	3·21	2·24	0·47	0·50	0·87 [p]	0·37	..	3·41 [uw]	..
	1929	,,	94·5	3·02	2·21	0·41	0·40	0·97 [p]	0·27	..	2·69 [u]	..
	1939	,,	81·4	3·38	2·59	0·42	0·37	1·08 [p]	0·24	..	2·41 [uw]	..
	1948	,,	243·9	2·54	1·80	0·38 [r]	0·36	0·78 [p]	0·21	..	2·21 [u]	..
U.S.S.R. non-agricultural population	1928	I.U. b.	20·3	0·50	..	..	..	..	..	..	..	..
	1938	,,	29·2	1·53	..	..	..	..	..	..	..	..
	1951	,,	47·7	1·81	..	..	..	..	..	..	..	..
	1953	,,	55·3	2·00	..	..	..	..	..	..	..	..
Uruguay .	1940	..	..	..	..	52 [s]	..	..	..	..	..	..
Venezuela .	1940	..	..	..	..	45 [s]	..	..	..	..	..	..

Public Authorities Capital (inc. in previous columns)	Not included in previous columns: Foreign Assets	Agricultural Land	Urban Land	Non-Income yielding Consumer Durables	National Debt	Capital in I.U. per Person engaged in Industry in Question: Agriculture (ex. Land)	Manufacture	Source
..	..	..	..	..	..	..	2200	Inter-American Development Comm.
..	..	..	..	..	..	..	..	" "
..	..	..	..	..	..	..	..	" "
..	..	..	..	..	..	..	..	Vandellos, *Metron*, 1925
..	..	2·32		0·76	0·76	..	..	Barthe, quoted Stamp, *J.R.S.S.*, 1919
..	..	..	..	..	..	..	..	Grau, *Weltwirtschaftliches Archiv*, Jan. 1935
..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	
..	0·58 [c]	2·59	..	..	..	..	..	De Foville, *J.R.S.S.*, 1893
..	..	..	..	..	..	..	..	Flodström, quoted Stamp, *J.R.S.S.*, 1919
..	0·46 [c]	1·29	..	..	..	..	..	Fahlbeck, quoted Stamp, *J.R.S.S.*, 1919
..	..	..	..	..	..	..	..	Bonné, *Econ. Dev. of the Middle East*
..	..	..	..	..	..	..	..	" "
..	..	..	..	..	..	..	..	Frankel, *Capital Investment in Africa*
..	..	..	..	..	..	..	..	" "
..	..	..	..	..	..	..	..	" "
..	..	..	..	..	..	..	..	Levi, *J.R.S.S.*, 1860
..	..	..	..	..	..	..	..	"
..	..	..	..	..	..	..	..	"
..	..	..	..	..	..	..	..	"
..	0·94	2·07		0·56	..	..	..	Douglas, *Jour. of Economic and Business History*, Aug. 1930
..	1·07	1·72		0·60	..	..	..	" "
..	1·15	1·40		0·80	..	..	..	" "
..	1·24	0·90		0·65	..	..	..	" "
..	1·10	0·66		0·51	..	..	..	" "
..	1·28	0·61		0·47	..	..	..	" "
0·16	1·43	0·47		0·33	0·29	..	..	Stamp, *J.R.S.S.*, 1919
0·20	0·11 [m]	0·21		0·33	1·40	..	..	Stamp, *J.R.S.S.*, 1935
..	..	..	..	..	..	..	..	Redfern, *J.R.S.S.*, Part I, 1955
..	..	..	..	..	..	..	..	" "
0·03	−0·09 [q]	..	1·13	0·06	..	..	..	Goldsmith, *Income and Wealth of the U.S.*
0·05	−0·06 [q]	1·08	0·16	0·12	..	..	..	" "
0·09	−0·06 [q]	..	1·51 [o]	0·26	..	..	..	" "
0·14	−0·14 [q]	..	..	0·38	..	..	..	" "
0·21	−0·07 [q]	..	1·90 [o]	0·39	..	..	..	" "
0·25	0·01 [q]	..	1·69 [o]	0·41	..	..	..	" "
0·30	0·19 [q]	..	1·44 [o]	0·47	..	..	..	" "
0·31	0·18 [q]	..	1·25 [o]	0·45	..	..	..	" "
0·50	0·26 [q]	..	1·14 [o]	0·40	..	..	..	" "
0·35	0·18 [q]	..	0·58 [o]	0·37	..	..	..	" "
..	..	..	..	..	..	..	..	Chapter IV above
..	..	..	..	..	..	..	..	"
..	..	..	..	..	..	..	..	"
..	..	..	..	..	..	..	..	"
..	..	..	..	..	..	..	1030 [t]	Inter-American Development Comm.
..	..	..	..	..	..	..	2300 [t]	" "

[*Notes for Table I on following 3 pages*

NOTES FOR TABLE I

Africa to France :

[a] I.U. per head of total population.

[b] New South Wales only. Total capital including land and consumer durables were estimated at £0·87 million in 1813, £18·2 millions in 1838, £69·4 millions in 1863.

[c] Livestock only.

[d] Excluding railways and post office.

[e] Including tramways and telegraphs.

[f] Based on Knibbs, excluding Government buildings and land.

[g] Based on Coghlan's figures for New South Wales (*Year Book*, 1904–5).

[h] Assumed 10 per cent below 1911–13.

[i] $ per head of population.

[j] Including mining : manufacture and mining together employ 13,000 (*Economic Survey of Latin America*).

[k] Manufacture employs 816,000 (*Economic Survey of Latin America*).

[l] Share capital.

[m] Chinese dollars per hectare, of which 66 livestock, 250 buildings, 46 improvement.

[n] Manufacture employs 103,000 (*Economic Survey of Latin America*).

[o] An earlier estimate by Hansen (quoted in Neumann-Spallart) gives 2 md. thalers for 1873 (presumably including land).

[p] Data from Bonné, *Economic Development of the Middle East.* Of the public authorities figure, 0·22 represents irrigation works.

[q] Of which three-quarters was value of livestock.

[r] Of which one-third was value of ships.

[s] Including land.

[t] Livestock only.

[u] Japanese-invested capital, yen per head of population.

[v] Coefficients estimated by Economic Commission for Latin America in *Preliminary Study of the Technique of Programming Economic Development*, 1953. Fixed capital only.

[w] All transport and public utilities.

[x] For economic activities not specified in the following columns, a coefficient of 1·67 was estimated.

Germany to Pakistan :

[a] Helfferich estimated that between 1896 and 1912 the money value of capital rose 50 per cent, while money income rose 78 per cent. The ratio of capital (*including* land) to income must therefore have fallen considerably.

[b] $ per head of population.

[c] All transport and communication.

[d] Including farm buildings and livestock.

[e] I.U. per head of population.

[f] Average Arab farm (with 1·5 males at work) had capital of £P70 (£ stg. 50) only, including dwelling. Average Europeanised farm capital £P400 (including £P140 for irrigation).

[g] Extremely conjectural.

[h] All capital other than buildings.

[i] Industry, railways and banking.

[j] Livestock only.

[k] Land and buildings.

[l] Earlier data compiled by Professor Coppola d' Anna indicate that it took until 1871–75 for the real volume of capital to recover to the 1860 level (slightly

later for real capital per head): no doubt the outcome of the wars of 1860 and 1866. His figures also indicate that real capital (including land) increased by 42 per cent between 1928 and 1938 while real product hardly increased at all. Hours had been greatly reduced during the 1930s, and there was probably serious under-utilisation of capital.

[m] At 1930 prices: income of 1929 shown for 1930.

[n] Company capital (Uyehara, *Industry and Trade of Japan*). Had risen to 0·95 by 1928.

[o] Excluding buildings.

[p] Japanese-invested capital, yen per head of population.

[q] Including land, non-income yielding consumer durables, foreign assets.

[r] From *Anlagevermögen und Dekapitalisation in der deutschen Industrie*, 1950. Net income produced assumed to be three-quarters of " Value Added ".

[s] At 1915 prices.

[t] Equipment and buildings, excluding stocks.

[u] Including 0·22 merchant marine in 1884 and 0·28 in 1939.

[v] Net debt abroad.

[w] Agricultural capital requirements are expressed as multiples of the expected income (1130 rupees) of a typical and irrigated farm of 15 acres.

[x] Draft oxen 0·35, equipment 0·09.

[y] Of which 0·18 the original (grazing) value of the arid land, the remainder the cost of developing it as an irrigated farm.

[z] For 290,000 workers. Nearly the same capital, in the aggregate, is used in mining, where 2500 I.U. per worker is required.

[aa] Spengler, World Population Conference, 1954.

Panama to Venezuela:

[a] $ per head of population.

[b] Spengler, World Population Conference, 1954.

[c] Net debt abroad.

[d] Including land.

[e] I.U. per head of working population.

[f] Overseas capital only. Includes investment in the Rand of 0·72, 0·79 and 0·45 (of total South African national product) respectively.

[g] Including all Ireland up to 1914, Northern Ireland subsequently.

[h] Real net product at 1948 market prices.

[i] Including an addition of 6·7 per cent for minor excluded items. Redfern's data do not cover stocks, which are shown (for 1952) in the 1954 Blue Book; and a similar figure is assumed to prevail for 1938.

[j] The study of Professor (now Senator) Douglas does not include buildings. Stamp's figure is extrapolated back to 1870 and forward to 1928 by Professor E. H. P. Brown (*Economic Journal*, June 1953). These figures exclude the structures and works of the railways, which are included with structures in Redfern's figures. Publicly owned property is also excluded before 1914.

[k] Tenants' capital only (excludes buildings).

[l] Between 1914 and 1928, Stamp's figures show a fall of 0·38 in structures and a rise of the same order of magnitude in equipment. Brown's figures show little change in either figure. The latter conclusion is more probable.

[m] Foreign holdings of U.K. assets: British holdings of foreign assets not covered by survey.

[n] Including land and non-income yielding capital.

[o] Including minerals (rising from 7 per cent of the whole in 1880 to 10 per cent in 1939). Goldsmith's data are given at 1929 prices.

[p] Farmers' residences included with farm capital.

[q] Including holdings of gold and silver: net *debts* before 1912.

[r] A recent article in *Survey of Current Business* (December 1954) on depreciated stock of producers' durable goods in the hands of private business (adjusted slightly for Government equipment) indicates that this ratio probably rose to 0·45 by the end of 1953.

[s] $ per head of population.

[t] For 66,000 manufacturing workers in Uruguay and 46,000 in Venezuela.

[u] Creamer, National Bureau of Economic Research, *Occasional Paper* 41, p. 43. Capital and output both valued at 1929 prices, and net income produced assumed to be three-quarters of "Value Added" (output less purchased materials and fuel).

[v] 1914. [w] 1919. [x] 1937.

contd. from p. 571]

Professor J. J. Spengler, in his paper at the World Population Conference 1954, claimed that as a general rule the structures and production equipment of any country represented in value somewhere between 2½ and 3 years' net national product. Including liquid capital the total figure of reproducible wealth should lie within the range 2½ to 4. All national wealth, including land values and national debt, lies within the range, he thought, of 4 to 6 years' net national product. He made the generalisation that transport and public utilities tended to be built in advance of their optimum utility. For this reason alone he thought there should be a long-run tendency for capital-output ratio to fall.

We have certainly come a long way from the *simpliste* view still widely held by responsible persons that, if you want to raise real national product, all that you have to do is to make an appropriate increase in the stock of capital. The more thoughtful workers in this field are coming to agree that while availability of capital may still be an important factor, many factors, some of them of a very intangible nature, constitute the real determinants of economic progress. Professor Spengler only was able to make his apportionment in numerical terms. Of the increases of the net national product of the U.S. since 1870, he concluded, increases in capital accounted for 20 per cent to 30 per cent only. Improvements in "technique and organisation" accounted for somewhere between 25 per cent and 50 per cent.

Another general view of the problem, relating to a

number of countries, has been made by Dr. Prebisch in the documents of the Economic Commission for Latin America, and in his paper to the World Population Conference. For Latin America as a whole he reckons that about 2·2 units of additional capital are required to raise gross national product by 1 unit per annum. This corresponds to a coefficient of nearly 2·4 of capital for each additional unit of net national product. Moreover these figures refer to fixed capital only, and might rise to over 3 if working capital were included.

Another important general rule about capital output ratio was stated by Dr. Everett Hagen.[1] He pointed out that, at the margin, the addition to capital required for a given increment of product may be much *lower* in a country where population is rapidly growing. He advances the classical (and entirely valid) reasoning used by Cannan and Professor Robbins when they first began to explore theoretically the prospects of a stationary population. "A rapidly increasing labour force", as Dr. Hagen tersely sums it up, "absolves a country from penalty for almost all mistakes in investment." The defects of humanity being what they are, there is always a considerable amount of misjudgment of investment, which is sometimes corrected, but much more often made worse by political intervention. But a rapidly increasing population is nearly always able to make *some* use of these misjudged investments within a few years, whereas with a stationary population they may turn out to be a very serious net burden. Dr. Hagen therefore sees a growing population as a source of economic advantage in this respect, subject to the limiting condition that it must not, through lack of its own resources and inability to trade for resources elsewhere, run into such a scarcity of raw materials that unusually costly investments have to be made to produce or substitute them.

Within the field of manufacture, the capital requirements of individual industries are deserving of study.

[1] In his paper to the International Association for Research in Income and Wealth Conference, 1953.

[*contd. on p.* 584

TABLE

Capital per Occupied Person in Manufacturing

Industry	Australia 1936–37 [m] £1 Stg.=£A1·25			Brazil 1945 [n]	Canada [m] 1936 £1=$4·97	Denmark [q] 1928	Germany [p] 1936
	Total	Land [h] and Buildings	Plant and Machinery				
1. Food, Drink and Tobacco	624	312	312	387	1118	600	700
2. Clothing and Bedding .	132	98	34	..	361	..	355
3. Textiles	252	113	139	123	813	..	345
4. Leather, Fur, and Rubber	280	174	106	..	942	..	405
5. Chemicals	886	321	565	..	2084	..	1255
6. Paper, Stationery and Printing . . .	374	208	166	..	1871 [a]	..	400
7. Furniture, Woodwork, Pottery, and Glass, Miscellaneous	199	132	67	..	730	..	303
8. Building Materials	314	136	178	..	928	..	
9. Light Metals and Electrical Products . .	203	116	87		1130	..	481
10. Semi-Manufactured Metals and Engineering .	278	170	108	153	976		
11. Metal Extraction and Refining . . .	462	142	320	..	2244	915	572
TOTAL: Manufacturing .	330	172	158	283 [o]	1107	703	513
Electric Light and Power	4348	1106	3242	..	..	6250	2500

[a] Official rate depreciated by one-third.
[b] Timber products.
[c] Stone, cement, etc.
[d] Miscellaneous.
[e] Electrical appliances.
[f] Machinery.
[g] Metal works.
[h] Includes rented premises and plant.
[i] Excludes rented premises and plant.
[j] Includes a small proportion of Unspecified Capital, but excludes Cash and Accounts.
[k] The smallness of this figure is due to the exclusion of rented premises.
[l] Includes Cash and Accounts.
[m] From *The Industrialization of Backward Areas*, by K. Mandelbaum. Oxford Institute of Statistics, Monograph No. 2.

II

Industry about 1939 — £ Sterling

Hungary [m] 1937 £1=22·30 pengos [a]	India [v] 1938–39	Palestine 1936 [m] £1 Stg.=£P1: Total	Land and Buildings [i]	Plant and Machinery	Working Capital [j]	Roumania [m] 1937 £=670·60 lei	U.S.A. [r] 1939	Venezuela 1936 16 bolivares=£1
403	..	395	129	139	127	461	1635	249
45	..	118	1 [k]	30	87	73	435	268
137	206	269	69	108	92	163		
100	..	148	32	50	66	116	[t]	..
373	..	679	168	339	172	608	5430	640
173	..	187	27	125	35	288	1300	..
104	..	172 [b]	65 [b]	65 [b]	42 [b]	123	1210	..
		280 [c]	104 [c]	118 [c]	58 [c]	..	..	..
		172 [d]	32 [d]	90 [d]	50 [d]	..	..	..
193	..	..	..	..	..	118	2700 [u]	..
115	510	207 [e]	11 [e]	95 [e]	101 [e]	160	1350	..
155		173 [f]	51 [f]	74 [f]	48 [f]	249		
281		286 [g]	68 [g]	134 [g]	84 [g]	303		
193	507 [w]	293	81	128	84	248	1250	330
1849	1740	2701 [l]	..	..	..	..	2480 [s]	..

[n] *Foreign Commerce Weekly*, 22nd December 1945. It is there assumed that 20 cruzeiros are equivalent to $1, which is equated to £0·15 of pre-war purchasing power.

[o] About half of this was found to be foreign-owned.

[p] Data from *Anlagevermögen und Dekapitalisation in der deutschen Industrie*, 1950. Assumed 14 Rm. equivalent to £1.

[q] Warming, *Weltwirtschaftliches Archiv*, May 1936. Assumed 16 kr.=£1.

[r] National Industrial Conference Board.

[s] National Resources Committee (1935).

[t] £415 leather, £1470 rubber.

[u] Wood.

[v] Divatia and Trivedi, *Industrial Capital in India*.

[w] Including electric power. Of this total, £152 represented land and buildings, £179 plant and machinery, £174 working capital.

Nearly twenty years ago, Mr. Mandelbaum prepared for the Oxford Institute of Statistics a pioneering study on the industrialisation of backward areas, in the course of which he collected most of the available information on capital requirements per person occupied in the different branches of industry. His table can be supplemented by other information for that period which has since been published, but we are unlikely to be able to improve on it so as to make it more up-to-date for some years yet. For the closing years of the 1930s represented the end of a long period of comparatively stable prices. Most of the capital then in use had been installed after 1920 and it is therefore safe to assume that its book value (on which official statistics are based) was at any rate of the same order of magnitude as its replacement value. During a period in which there has been a very marked price change, it is not of course safe to make this assumption.

Some of the figures are striking, especially the remarkably low figures for Australia (other than in electricity) and the high figures for Denmark and India.

Apart from public utilities the heaviest investment is found in the U.S. figure for chemicals (much lower figures prevailing in Canada and Germany). In every country, however, this industry is the most demanding of all in respect of capital per worker. Textiles and clothing in every case are about the least demanding, as also is leather (rubber is a more capital intensive industry).

For manufacture as a whole in Venezuela, and for three component groups, official figures were given of the ratio of capital to turnover. This was uniformly higher than in the United States.

TABLE III

	Venezuela 1936	U.S.A. 1937
All manufacture	1·09	0·74
Textiles	1·04	0·58
Food, drink and tobacco .	0·96	0·51
Chemicals	0·88	0·81

It is also possible to compare capital requirements in dollars per worker in the principal sectors of the economy.

TABLE IV

	Venezuela 1936 *	U.S.A. 1935 †
Manufacture	1610	3,700
Transport, communication, public utilities .	7600	11,900
Mining	..	8,700
Agriculture	..	3,900
Commerce	235	2,000
Consumers' services	700	3,700

* Bolivares converted at 3·3 to the $.
† National Resources Committee.

Venezuela's relatively low investment in commerce, and high investment in public utilities, is noticeable.

Finally, we have two useful tabulations which show us, classified by industries, aggregate capital (but not capital per worker) in countries with manufacture at a fairly early stage of development.

TABLE V

AGGREGATE CAPITAL, MILLION I.U.

	Portugal 1913 *	Spain 1933 †
Textiles	47	215
Food, drink and tobacco	120	538
Mining	50	290
Chemicals	..	190
Metal and engineering .	..	298
Tramways	10	147
Cement and ceramics .	1	90
Electricity and gas . .	..	1170
Railways	180	1380

* Vandellos, *Metron*, 1925. Escudo = 1·2 I.U.
† Grau, *Weltwirtschaftliches Archiv*, January 1935. Peseta = 0·285 I.U.

Now that we have made clear the general background, of capital per unit of product first increasing and then diminishing, we may be able to understand more clearly the issues arising out of one of the most interesting (and

hotly disputed) problems of applied economics of recent years — namely the Cobb-Douglas productivity function.

Professor (now Senator) Douglas first published in 1926 a study of the growth of real product of U.S. manufacture (not national product as a whole) between 1899 and 1922, and the real volume of capital and labour employed to produce it (taking into account changes in the average length of the working week, and in the relative proportions of clerical and administrative to manual labour).

Describing output as P and the quantities of labour and capital as L and C, Professor Douglas, working in association with Professor Cobb, sought to obtain a functional relationship :

$$P = f(L, C)$$

assuming that $$mP = f(mL, mC),$$

where m is any constant.

Thus in effect he assumed that the productivity function must be a homogeneous linear function of the first order. He thus assumed away the possibility of general increasing returns or general diminishing returns. An improved version of the formula in which this consideration is taken into account is discussed below.

Professor Cobb after numerous experiments suggested a suitable type of function, satisfying the above condition, and also satisfying the condition that when either L or C is zero, the product P must also be zero, namely :

$$f(L, C) = bL^k C^{1-k},$$

where k and b are constants.

Fitting constants by the method of least squares, Douglas and Cobb obtained for the U.S.A. over this period the relationship

$$P = 1{\cdot}01\ L^{0{\cdot}75}\ C^{0{\cdot}25}.$$

Results computed from this formula agree very closely with the actual data.

The best check of this formula, in the first instance, is provided by using entirely independent data for the State

of Massachusetts (covering the period 1890–1926). The formula obtained, using a similar technique, was found to be

$$P = 1{\cdot}007\, L^{0{\cdot}743}\, C^{0{\cdot}257}.$$

It must, however, be admitted that for Massachusetts the fit was not nearly as close as for the U.S.A. During the years 1914 to 1920 the actual product was anything from 6 to 17 per cent below that computed by the formula, while from 1922 onwards the actual product was 10 to 20 per cent in excess of that computed by the formula. It is found below that the formula for U.S.A. as a whole ceased to apply after 1922. But over the period 1899–1920 it seems to be established that some such formula held with considerable precision.

A further study for Massachusetts by Professor Cobb,[1] removing the provision that the exponents of L and C must add up to 1, gave much less satisfactory results, with the exponent of L at 0·95 and the exponent of C at 0·48. Computing the figures for individual industries, great diversities were found, with the capital exponent sometimes negative. It may be significant, however, that throughout this period in Massachusetts labour's share of the product was substantially higher than in the U.S. as a whole.[2]

On the other hand, when Professor Douglas removed the assumption that the two exponents must add up to unity his computation for the U.S. as a whole was not greatly altered. This confirms the hypothesis that, up to 1922, American industry as a whole was not showing increasing returns to scale (though it seems clear that such returns were obtained in some industries). After 1922, with more marked increasing returns and decline in capital requirements per unit of output[3] (these two factors may well be interconnected), we must expect quite different relationships to prevail. Even before 1922, a better fit might be

[1] *Journal of Political Economy*, 1930.

[2] Moulton and Pannier, *Journal of the American Statistical Society*, 1927, p. 565.

[3] The decline in capital per unit of output in manufacture is even more clearly marked than in the economy as a whole. See Mr. Creamer's study for the National Bureau of Economic Research (*Occasional Paper*, 1954). The turning point, for nearly every manufacturing industry, came about 1919.

obtained if a general upward time trend were allowed for, to distinguish more precisely the marginal effects of capital and labour. Each factor of course is fairly highly correlated with time.

Some critics, particularly Mr. Mendershausen,[1] have claimed that all the variables are so highly inter-correlated with each other and with time, and that Professor Douglas's results are so dependent upon the data of certain exceptional years, that the whole conclusion is invalid. To meet such criticisms, Professor Douglas and his co-workers set out to collect data from all other countries for which capital statistics were available; and also submitted their conclusion to the fundamental check of using a similar formula to compute the products of a number of different industries at a single date, rather than a time series. Its successful use in this latter direction seems to be a final proof that there must be something real about this relationship and that it is not just a statistical illusion.

To obtain an external check, Professor Douglas turned his attention to Australian statistics. For manufacturing industries in the State of New South Wales over the period 1901–27, working in the same way, he obtained a formula:

$$P = 1{\cdot}02\ L^{0{\cdot}65}\ C^{0{\cdot}35}.$$

The volume of production, which showed a threefold increase over this period, was predicted by the formula with an average error of 2·5 per cent, and a maximum error of 6 per cent (for 1915 under abnormal war conditions). For the State of Victoria, again using the same technique, he obtained a formula, relating to the period 1907–29, of

$$P = 0{\cdot}97\ L^{0{\cdot}71}\ C^{0{\cdot}29}.$$

In this case the volume of production was more than doubled and its course predicted with an average error of 5 per cent. During the last three years, in this case, the actual production was considerably in excess of computed value.

As Professor Douglas shows, the marginal productivity of capital is related to the exponent, for the partial differ-

[1] *Econometrica*. April 1938.

entiation of P with respect to C will give the increment of output consequential upon an increment of capital:

$$P = bC^{1-k} L^{k},$$

$$\frac{\partial P}{\partial C} = (1-k)\, bC^{-k} L^{k} = (1-k)\frac{P}{C}.$$

In other words, the marginal productivity of capital is inversely proportional to the amount of capital at present in use per unit of output (which is not surprising) and also to the exponent of capital $(1-k)$ in the above formula. Or, as Professor Tinbergen puts it (*Quarterly Journal of Economics*, May 1947), the equation for marginal productivity of capital can be written

$$\frac{\partial P}{\partial C} = b(1-k)\,(L/C)^{k},$$

i.e. "interest rates should move inversely with the 2/3 or 3/4 power of the relative scarcity of capital. Very roughly, the figures at our disposal seem to confirm this result."

Similarly the marginal product of labour is

$$\frac{\partial P}{\partial L} = kbC^{1-k} L^{k-1} = k\frac{P}{L}.$$

Therefore the aggregate income of labour will be

$$L\frac{\partial P}{\partial L} = kP.$$

Table VI summarises Professor Douglas's results where the exponents are independently determined, and also the share of labour in the product which should provide an independent measure of k.

In an unpublished thesis submitted to the University of Cambridge by Dr. Max Brown, the exponents for New Zealand over the period 1915–35 were computed at 0·52 for labour and 0·48 for capital. Labour's share in the net product during the 1920s was found to be exactly 52 per cent. For the New South Wales period (Table VI) labour's share in the product was found to be only 56 per cent, as against an exponent of 0·65.

A classification of the industries covered by the U.S. Census (Douglas and Bronfenbrenner, *Journal of Political Economy*, 1939) in 1909 gives results shown in Table VII.

We may deduce from these results that largely constant

TABLE VI

		Exponent L	Exponent C	Share of Labour in Product	Source
Time series:					
U.S.A.	1899–1922	·76	·25	·74	*Quarterly Journal of Economics*, May 1940
Victoria	1901–29 .	·84	·23	·61	"
Comparison of industries at given date:					
U.S.A.	1904 .	·65	·31	..	*Journal of Political Economy*, February 1943
	1909 .	·74	·32	·68	*Journal of American Statistical Society*, June 1943
	1914 .	·61	·36	..	"
	1919 .	·76	·25	..	*American Economic Review*, March 1941
Canada	1923 .	·48	·48	..	*Journal of American Statistical Society*, June 1943
	1927 .	·46	·52	..	"
	1935 .	·50	·52	..	"
	1937 .	·43	·58	..	"
Australia	1912 .	·52	·47	·54	*Quarterly Journal of Economics*, November 1941
	1922–23 .	·53	·49	·54	"
	1926–27 .	·59	·34	·57	"
	1936–37 .	·49	·49	·51	"
	1934–35 .	·64	·36	·61	*Quarterly Journal of Economics*, May 1941
New South Wales,	1933–34	·65	·34	·51	"

returns prevailed at that date, and that labour at that date was apparently obtaining less than the return due to its marginal productivity. This seems to have been particularly the case in the clothing and textiles trades where the marginal productivity of capital appears to have been negligible.

For the period 1920–40 Professor Burton Wall (*Econometrica*, April 1948) fitted a function determining the

TABLE VII

	Exponent of Labour	Exponent of Capital	Share of Labour in Product
All industry . .	·74	·32	·68
Most capitalistic industries	·70	·25	·61
Least capitalistic industries	·74	·22	·71
Monopolistic industries	·68	·36	·67
Sweated industries .	·79	·16	·68
Clothing and textiles .	·98	−·07	·69
Food and drink . .	·71	·35	·56
Metals and machinery	·71	·26	·73

exponents independently and allowing for a linear upward trend, in U.S. mining and manufacture:

$$P = bL^{1\cdot 34}\, C^{0\cdot 93}.$$

If this equation be true, labour's marginal product will exceed the whole product and the equilibrium will be indeterminate.

A most ingenious demonstration of the Douglas formula has been made by Messrs. Divatia and Trivedi in *Industrial Capital in India*. Capital used by Indian manufacturing industry in 1938–39 is estimated by them from various sources at 6748 million rupees. They then note that $\frac{C}{P}$ in India is 14 per cent below the Canadian level for given industries, and deduce from this that k is probably reduced from the Canadian level of 0·468 to about 0·402. Taking this value of k they fit an equation for India of

$$P = 12{\cdot}17\, L^{\cdot 402}\, C^{\cdot 598}.$$

From this equation they deduce a theoretical value of C of 7282 million rupees, which compares fairly closely with the value already obtained.

Mr. Bhatia[1] criticises this result as not statistically

[1] *Journal of the University of Bombay*, January 1954.

significant. He finds (making no assumption that the exponents add up to unity) an exponent of 0·67 for labour and 0·26 for capital in India in 1948 (comparing different industries at the same date). Labour's share of the product in fact was only about 50 per cent, and he goes on to make an interesting calculation on the basis of Mrs. Robinson's formula that where some degree of monopoly prevails among manufacturers, and labour is in a weak bargaining position, then the wage actually paid may be expected to be

$$\text{Competitive wage} \times \left(\frac{e-1}{e}\right) \times \left(\frac{\mathrm{E}}{\mathrm{E}-1}\right),$$

where e is elasticity of demand for production,
E is elasticity of supply of factor.

Assuming that the elasticity of supply of labour in India is almost indefinitely high, he then deduces that the price elasticity of demand for Indian manufactures must be about 3 — quite a plausible result.

Some fairly precise figures are available from Pakistan showing the capital costs and productivity per worker of

TABLE VIII

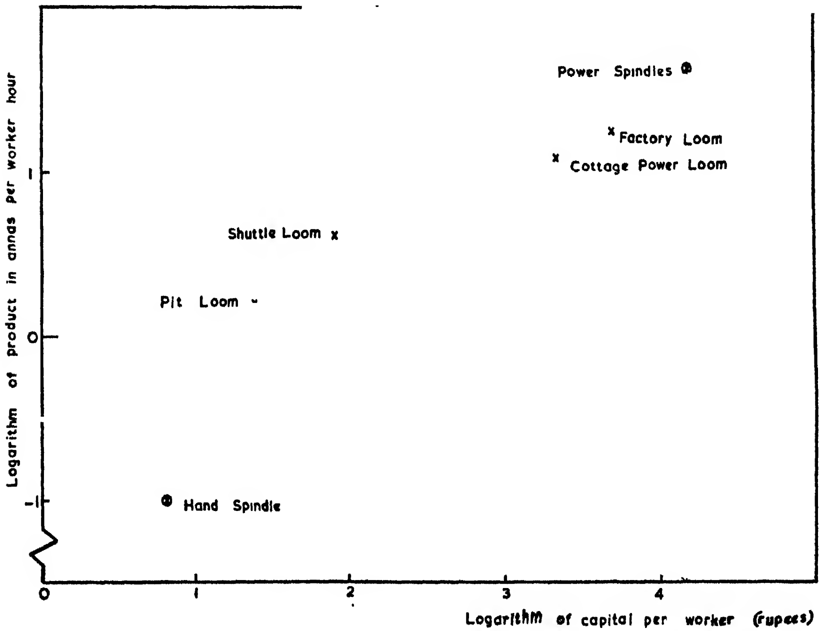
DEVELOPMENT OF PRODUCTIVITY OF CAPITAL IN PAKISTAN
(Data from Mr. Mahomed Akbar Khan, Department of Industries, 1952)

Weaving	Capital per Worker (rupees)	Product per Worker per Hour *	
		Quantity	Value † in Annas
Pit loom	25	0·45 yard	1·60
Shuttle loom . . .	80	1·2 yards	4·27
Cottage industry power loom	2,200	3·5 ,,	12·45
Factory	5,000 ‡	5·0 ,,	17·80
Spinning:			
Hand spindle . . .	6·5	0·21 ounce	0·10
Factory spinning § . .	15,400	91·8 ounces	42·90

* Assumed 8-hour day in factories, 10 elsewhere.
† "Value added" to purchased materials less waste, i.e. 7·5 annas for 1 lb. of yarn, 3·56 annas per yard of 4 oz. cloth.
‡ Capital cost, including generator and air conditioning, per loom. Average mill employs, per loom, 0·5 weaver and 0·5 other worker, or 1 in all.
§ 440 spindles per worker.

various methods of spinning and weaving. On the diagram, drawn with a double logarithmic scale, it is seen that all the data except for hand spindles appear to lie near a single line. The slope of this line should measure the exponent of capital, which appears to be about 0·5, lower than the Divatia and Trivedi figure, higher than Bhatia's.

Finally, a successful application of this method was made[1] to the British coal industry (perhaps this was



chosen because it is not an increasing returns industry). Assuming that the two exponents add up to unity, and comparing the productivity of different regions at a given date, a labour exponent of 0·79 and a capital exponent of 0·21 were found. Examining time series, and removing this assumption, the exponents were found to be 0·79 and 0·29. Mr. Lomax thought that this latter might indicate a slight degree of increasing returns, but pointed out that

[1] Lomax, *Journal of the Royal Statistical Society*, 1950, Part III.

the difference was probably within the margin of error of the data.

We now turn to the question of the measurement of the rate of capital formation. The problem of valuation, which has hitherto been largely avoided by expressing capital as a multiple of national or sector product, both being measured in current money values, cannot now be escaped. It is necessary to find methods for converting values for different countries and for widely different times to some common measure. This problem, as will be seen from what follows, has not been satisfactorily solved.

Buildings and structures represent a large proportion of capital stock, a somewhat smaller proportion of annual capital formation (because they do not have to be replaced so often as equipment). In constructing a price index for capital formation, we should have to value these two main components of building and equipment. We cannot do so at present because, as we see below, our information about their relative importance is altogether too uncertain and inadequate. It has already been remarked in Chapter VII that in the poorer economies the relative price of building is generally much lower than in the richer economies, for the simple reason that building is a "labour intensive" operation, and that therefore the relative efficiencies between different countries and times cannot vary so greatly in building as they do in most other activities.

The O.E.E.C. studies for relative prices in the U.S. and four European countries show that, in the purchase of producers' durable equipment, the converse seems to hold. They also show some figures of relative costs of building which differ appreciably from those given in Chapter VII, and which show, in some cases, that the relative costs of commercial and industrial construction may move very differently from those of residential construction. Table IX summarises the geometric means (of American weighting, and of the weighting of the country in question) for the purchasing power of four European currencies.

The extraordinary discrepancies shown (except in France) between costs of residential and commercial construction are possible, but do not seem very probable; this is not the most precise part of the O.E.E.C. report. The apparent extreme cheapness of residential construction in Germany, as shown here, is very much in conflict with the evidence in Chapter VII, from which we would deduce a figure nearly twice as high as that given in the table below.

TABLE IX

RELATIVE PURCHASING POWER OVER CAPITAL GOODS, 1950

	Number of £ equivalent to $1	Number of French Francs equivalent to $1	Number of Deutsch-marks equivalent to $1	Number of Lire equivalent to $1
Purchasing power over—				
Gross national product in general	·251	264	3·03	435
Construction of residences	·165	226	1·37	212
Other construction . .	·300	234	2·81	385
Producers' durable equipment	·323	406	4·46	871

However, the general conclusion is that in Europe construction is a good deal cheaper than is construction in the U.S., but that in every case producers' durable equipment, as compared with the price of goods in general, is relatively dearer. In Britain the price difference is about 30 per cent, in Italy double. Such indications as we have about the price of producers' durable equipment in India lead to a similar conclusion. Even where the price of the goods is not affected by tariffs or import restrictions the cost of selling, transporting and installing imported equipment raises relative prices considerably; while "goods in general" include services, which will be cheaper in the poorer country.

We thus see that the two elements in any index of capital goods prices, construction and producers' durable equipment are, as we proceed from the wealthier countries

[*contd. on p.* 600

TABLE

GROSS DOMESTIC CAPITAL FORMATION

Net figures

	1954	1953	1952	1951	1950	1949	1948	1947
Argentine	..	683	741	961	1,039	1,049	1,137	838
Australia [a]	2185	2025	1,575	2,425	1,849	1,650	1,117	1,265
Austria	..	..	465	515	387	424	313	..
Belgium [b]	..	..	677	701	752	644 [o]	604	523 [n]
Brazil	..	1073	1,247	1,090	980	878	768	820
Canada	..	..	3,122	3,285	2,936	2,595	2,445	2,335
Chile	..	125	121	121	108	132	119	102
Colombia	..	222	209	202	234	180	192	217
Cuba	..	134	130	149	133	117	113	122
Denmark	..	..	464	515	617	486	432	389
El Salvador	..	35	35	33	30	24	17	18
Finland [j]	..	515	539	493	420	370	345	..
France	..	..	3,800	4,520	4,490	4,560	3,470	3,280
Germany [p]	..	..	5,300	5,310	4,150	3,160	2,620 [q]	..
Greece	..	..	174	241	255	229	119	..
Guatemala	..	32	33	34	33	27	36	32
Hungary [t]	..	..	..	..	..	..	..	..
India [v]	..	3880*	3,050*	2,280*	1,940*	1,890*	1,940*	..
Ireland	..	..	157	222	215	182	180	174
Israel	312	273	..	..	212 [w]	..	..	..
Italy	..	..	2,840	2,640	2,025	2,055	1,990	2,260
Japan [y]	..	4040	3,780	3,480	2,525	2,765	2,510	2,260
Mexico	..	432	477	477	446	425	395	364
Netherlands [z]	..	940	914	1,357	1,532	1,218	1,152	1,041
New Zealand [aa]	..	368	444	..	..	350	..	..
Norway	..	517	495	522	479	509	467	472
Peru	..	209	182	175	126	106	71	111
Poland	..	..	..	..	..	..	..	..
Portugal [bb]	..	..	170	169	161	152	150	140
Sweden [cc]	..	..	1,010	1,012	892	815	850	910
Switzerland [hh]	..	..	..	..	..	..	..	..
Union of South Africa [ee]	..	..	..	..	..	..	..	..
United Kingdom [ff]	..	4450	3,950	3,885	3,916	3,740	3,460	..
United States	..	..	34,700	38,600	36,100	25,900	29,900	25,300
Venezuela	..	343	380	340	302	394	556	121

X

Converted to Millions of I.U.

indicated by *

1946	1945	1938	1935–39	1930–34	1929	1925–29	1920–24	1913	1901–11
626	596	..	..	..	..	..	..	..	..
1081	..	1,060	..	..	..	..	..	..	..
..	..	..	..	..	94 [d]	..	..	..	..
..	..	166 [o]*	..	..	..	..	..	..	..
582	425	..	..	..	..	..	..	..	..
..	..	1,113	..	820 [e]	2000 [f]	1650 [f]	930 [f]	..	485 [g]*
85	94	..	70 [h]	..	..	..	..	..	..
198	138	..	..	..	..	..	..	..	..
90	28	..	..	..	..	..	..	..	..
..	..	302	246 [i]	219 [i]	..	..	..	..	..
12	10	..	..	..	..	..	..	..	..
..	..	233	..	..	..	..	..	..	..
..	..	2,260 [k]	..	..	1342 [l]	..	..	280 [m]*	..
..	..	3,400 [r]	5215 [u]	2000 [u]	3290 [u]	3530 [u]	..	.. [s]	..
..	..	177	..	..	..	..	..	..	..
18	13	..	..	..	..	..	..	..	..
..	..	..	40*	42*	60*	45*	..	..	..
..	675*	..	770*	680*	..	750*	665*	..	..
..	..	128	..	..	..	..	..	..	..
..	..	94 [w]	..	..	..	..	..	..	..
..	..	2,505 [x]	..	..	..	..	..	..	..
1540	..	3,360	3220	2200	2180	1890	1380	640	..
319	273	426	..	..	..	..	..	..	..
..	..	484	150*	25*	370*	274*	138*	..	..
..	..	201	..	..	..	..	..	..	..
..	..	307	301	210	215	180	162	147	90
98	52	..	..	..	..	..	..	..	..
..	..	..	..	..	340*	..	..	..	..
..	..	54	..	..	..	..	..	..	..
..	..	560	..	..	558	487	397	354	270
..	..	..	..	..	..	247 [dd]	..	..	..
..	..	255*	235*	82*	117*	105*	71*	..	..
..	..	3,935	3840	2840	3110	2720	..	..	..
..	..	11,500 [gg]	..	..	..	..	..	..	..
248	110	..	..	..	..	..	..	..	..

[*Notes on pages* 598-600

NOTES FOR TABLE X

[a] Twelve months commencing 1st July of year indicated. In 1950–51 one square metre of housing cost £19·4 in Australia and about $90 in U.S.A., so for construction we can rate the £ at $4·65. Its exchange value was $2·24 and its purchasing power over producers' durable equipment is taken at $1·90. The purchasing power of the £ over construction is estimated for other years from the cost of a standard house, and over equipment by changes in the prices of British exports, and the two are combined with equal weights.

[b] Changes in stocks of goods not included.

[c] The *Economist*, 24th June 1939, estimated savings at 5–6 billion francs.

[d] Gross, *Weltwirtschaftliches Archiv*, July 1931 : figure for 1928.

[e] Steindl, *Bulletin of Oxford Institute of Statistics*, 22nd February 1941.

[f] *Monthly Review of Business Statistics*, July 1944. Difference between gross and net in 1930 was about 660 million I.U. (Steindl).

[g] From Coates's *Report on Prices*, 1915. Almost exactly half of this was financed by capital inflow.

[h] Coers, *Estadistica*, March 1944. Data for 1936–40.

[i] From *Statistiske Meddelelsen*, 1948, 5. Haefte, p. 167, reckoned in krone of 1935 purchasing power. Apparently the definition then adopted was less comprehensive than the post-war definition. Net investment was reckoned at 114 and 126 million I.U. respectively for the two periods. The old series carried on to 1949 (*Statistiske Meddelelsen*, 1951, 2. Haefte, p. 103) indicates for that year gross investment of 614 million I.U. and net investment of 237 million I.U.

[j] Includes all repair and maintenance expenditure.

[k] Balogh (*Bulletin of the Oxford Institute of Statistics*, August 1946) estimates net investment in 1938 at only ⅛th of gross. For 1929 he estimates 4010 million I.U. gross, 1290 net.

[l] For 1928–30 : from Marschak and Lederer's *Kapitalbildung*. Estimated net investment 873 million I.U. Includes depreciation but not maintenance.

[m] From data reviewed by Goldenberg, *Quarterly Journal of Economics*, November 1946, and White, *The French International Accounts*. Net saving taken as mean of Lascaux's 3·0 billions and Pupin's 3·7 billions, less 2·26 billions external investment and gold accumulation. Earlier estimates :

Date	Source	Net Saving, b. francs	Net Internal Investment, b. francs	Net Internal Investment, m. I.U.
1903–11	Pupin	3·5	1·9	505
1895–1914	Lascaux	2·7	1·29	343
1892–1908	Théry	2·7	1·54	425
1895	Lascaux	2·5	1·55	418
1878–1902	Pupin *	2·04	1·15	303
1871	Neumann-Spallart	1·5		

* Pupin also states that the available data before 1870 indicate net saving at the rate of about 13 per cent of national income.

[n] This figure (34 billion francs) is given by the French periodical *Études et Conjoncture* (September-December 1948) as net investment, but it appears to be gross.

[o] Professor Baudhuin (*La Libre Belgique*, 29th April 1950) estimates net saving at 23 billion francs, net internal investment 17 billion francs, or 234 million I.U.

[p] West Germany since 1936.

[q] Annual rate for second half of year.

[r] 1936 : present West German territory. Figure for all Germany was 6·6 billion I.U. in 1938.

[s] Helfferich's estimate of net capital formation of 9·9 billion marks per annum in 1908–11 is reduced by 17 per cent if rise in land values is excluded, and a similar correction is applied to his earlier date. Foreign capital holdings rose from 10 billions in 1892 (Schmoller) to 25 billions in 1914 (Moulton, *Germany's Capacity to Pay*). Over the whole period 1896–1911 net internal investment averaged 5·1 billion marks or about 2·1 billion I.U. per year (2·4 billions, 1908–11 ; 2·0 billions, 1896–98 and 1902–4 ; 1·6 billions, 1899–1901).

[t] Matolcsy and Varga's figures. Net savings were inappreciable in 1925–29 (i.e. investment depended on capital inflow), but provided some two-thirds of net investment in 1930–34 and the whole in 1935–37.

[u] All Germany. To obtain net figures, deduct a figure rising from 1·6 billion I.U. in 1925 to 1·75 in 1929–31 to 2·0 in 1933–35 and 2·4 in 1938. Net capital inflow averaged 250 million I.U. per year in 1925–29, net capital outflow 190 million I.U. per year in 1930–34, inappreciable after that date. Data since 1928 from *Wochenbericht für Konjunkturforschung*, 26th January 1939. Entry under 1935–39 is for 1935–38.

[v] For this country we have no general factor for expressing the purchasing power of its currency in terms of I.U. Indian gross capital formation in 1949–50 (Mukherjee and Ghosh, International Statistical Institute, Delhi Conference, 1951) appears to have consisted (in terms of rupee value) about half of construction, in which the purchasing power of a rupee is about three times that of an equivalent amount of British currency, and about half of equipment, where the ratio would be about three-quarters. A simple mean of these ratios gives a ratio of 1·875, or 7·1 rupees equivalent to £1. Data for 1949 from above source (gross investment, 3680 million I.U.) brought up to date, in real terms, by an index calculated by Mr. Da Costa (private communication). Estimate for 1945 from *Eastern Economist*, 7th January 1949. Data before 1939 from Professor Thomas (private communication). Mr. K. N. Raj (World Population Conference, 1954) estimates net investment in 1950–51 lower, at 1540 million I.U. He expects the figure to rise to 4450 by 1960.

[w] Gruenbaum's estimate. Excluding "durable consumption goods" other than housing. Net investment in 1950 was approximately 155 million I.U., all of which was provided by capital inflow. The figure shown for 1938 is Gruenbaum's figure for 1936. Net investment was 64 million I.U. Capital inflow was about 70 million I.U. and net internal savings negative.

[x] Net national savings in 1939 were estimated at 16 billion lire or 808 million I.U. (Fascist Confederation of Industrialists, Business and Financial Report), and for 1914 at 2 billion lire or 460 million I.U. (*Economist*, 3rd March 1945).

[y] Professor Shinohara, Annals of the Hitotsubashi Academy, April 1955, for data before 1938. Inventory charges excluded throughout. Professor Staley in *World Economic Development* quotes lower figures (perhaps intended to show net investment) as follows (in millions of I.U. per year):

1933–38	1924–26	1912–14	1906–10	1896–98
1508	916	521	388	350

[z] Net investment 1923–29 from *Centraal Planbureau Overdrukken*, No. 26. Net external investment averaged 90 million I.U. in 1925–29, − 10 million I.U. in 1930–1934, 93 million I.U. in 1935–39. Depreciation in 1938 was estimated at 360 million I.U. (500 million guilders) by Dr. Dereksen (National Institute of Economic and Social Research, Paper X). Marschak and Lederer (in *Kapitalbildung*) show gross investment at 590 million I.U. for 1925–29, but estimate depreciation at only 110 million I.U. in 1925 and 180 million I.U. in 1929. The real volume of internal gross investment in 1912 appears to have been about the same as in 1925–29 : it is not possible to estimate external investment for that year.

[aa] Gross investment figures as published include the profits on revaluing stocks in years of rising prices. For this reason, valid figures can only be calculated for a limited number of years of stable prices.

[bb] Gross fixed investment only.

[cc] Data before 1930 from *The National Income of Sweden*, Part I, p. 255. Depreciation and maintenance (shown in the separate tables of debit items for the various industries) amounted to 80 million I.U. in 1901–11, 103 million I.U. in 1913, 142 millions in 1925 and 158 millions in 1929.

[dd] Marschak-Lederer average for 1925–30. Net investment, 130 million I.U. For the period 1900–10 it appears to have averaged 110 million I.U.

[ee] *South African Journal of Economics*, June 1944. Capital inflow provided 20 million I.U. in 1922–24, 43 millions in 1925–29, – 17 millions in 1930–34, and about 60 millions in 1935–39.

[ff] Data since 1924 from Redfern, *Journal of the Royal Statistical Society*, Part II, 1955, with addition of 6·7 per cent for minor excluded items, all reckoned at 1948 prices. Depreciation reckoned at 2075 million I.U. in 1938, 2200 in 1948, and 2615 in 1953. Equating the £ in 1900 to 9·72 I.U., we can use a series published by Cairncross and L'Enfant (*Economica*, May 1951) to compute the following results, in millions of I.U. per year:

	1873–77	1883–87	1893–97	1903–7	1911–13
Gross home investment	1802	1696	2288	2890	3290
Depreciation	790	949	1225	1425	1990
Net foreign investment	225	495	295	665	1850

Net savings 1855–65 were estimated by Baxter at £124 millions per year, of which £25 millions per year were invested abroad (the £ then being worth about 9 I.U.).

[gg] From data (at 1929 prices) in Professor Kuznets's *National Product Since 1869* we have the following, in million I.U.:

	1929–1938	1919–1928	1909–1918	1899–1908	1889–1898	1879–1888	1869–1878
Gross internal capital formation	9910	14,560	11,590	8240	6010	3880	2100
Net internal capital formation	965	6,480	6,090	4670	3625	2415	1187
Net external capital formation	635	850	1,215	–103	–2	–71	–154

[hh] Bank of International Settlements XXth Report estimates net savings at 18 per cent of national income in the 1930s and 15 per cent now.

contd. from p. 595]

to the poorer countries, pulling in different directions; and as we proceed to the poorest countries, both these pulls are intensified.

For the present, in default of any adequate system of weights, there seems to be no alternative in most countries but to use the measures of the general purchasing power of each country's currency at different dates, as obtained in Chapter II, to measure the real volume of capital formation. As will be seen later, this method is clearly

unsatisfactory and should be improved at the first possible opportunity.

In Table X capital formation is first measured gross. This convention is adopted primarily because it was used in the most comprehensive source, the O.E.E.C.'s "Statistics of National Product and Expenditure", from which are obtained all entries in Table X not otherwise indicated. The fixing of an appropriate measure of depreciation is not an easy task, even in periods of economic stability. During a period like the present, when prices in every country are at least twice what they were twenty years ago, and in some cases have risen 50-fold or more, the accountant's conventional method of estimating depreciation on the original cost of the asset is obviously inapplicable, and satisfactory alternative methods have not yet been devised.

Some information about depreciation is given in Table XI. The O.E.E.C. has done its best to systematise the definitions of gross capital formation, but some ambiguities probably remain. It is very difficult to draw the boundary line between a replacement which is meant to be included in gross capital formation, and a repair which is not meant to be included. Some countries, e.g. Norway, used a definition whereby all repair work was included, and the same was true of Professor Kuznets's original work for the U.S., where the definition has since been modified. The high depreciation figure for Norway shows that the definition is probably still "more gross" than in other countries.

In Table X a certain amount of fairly reliable information about net capital formation is available for the earlier years, and is shown with asterisks. Any other valid information enabling net capital formation to be estimated as well as gross is shown in the footnotes; as is also any information about net external capital formation, in countries where this figure is appreciable. In this way, some idea can be obtained of aggregate net savings as well as aggregate net external investment.

Table XI merely shows depreciation as it is given in the United Nations tables. It is fairly clear that there

[*contd. on p.* 604

TABLE XI

Depreciation as Percentage of Gross Product (or of Capital Stock)

	Most recent Year	1938	1929
Australia	6·1	5·6	..
,, *as per cent of capital*	*1·95*	*1·46*	..
Austria	7·1	..	..
Belgium	7·0 [a]	..	..
Brazil	4·9	..	..
,, *as per cent of capital*	*2·05*	..	..
Canada	9·7	10·5	11·4 [b]
,, *as per cent of capital*	..	..	*3·75*
Chile	3·2	4·5	..
Colombia	3·2	..	..
Cuba	5·5	..	..
Cyprus	4·2	..	..
Denmark	13·5	11·2 [c]	..
Finland	12·2	..	..
France	10·6	11·6	15·0 [d]
Germany	7·6	8·5	8·0
India	5·4 [e]	..	..
Ireland	2·9	2·5	..
Italy	8·7	8·6	..
Japan	6·3	6·7	..
Mexico	7·0	6·0	..
,, *as per cent of capital*	..	*3·55*	..
Netherlands	9·1	8·7	..
,, *as per cent of capital*	..	*3·30*	..
New Zealand	5·9	7·3	..
Norway [f]	18·1	14·8	..
Puerto Rico	4·7	..	..
Sweden	..	..	7·2 [g]
Switzerland	..	..	7·2
Turkey	3·5	4·8	..
United Kingdom	7·8	6·9	..
,, *as per cent of capital*	*3·30*	*2·75*	[h]
United States	7·5	9·2	8·5 [i]
,, *as per cent of capital*	*3·62*	*3·35*	*3·54*

NOTES FOR TABLE XI

[a] Professor Baudhuin's estimate for 1949.

[b] Data for 1929 and earlier from Firestone. For 1870 and 1920 he indicates a percentage of 7·0, for 1900 8·3 (4·32 per cent of capital).

[c] In the official figures published at the time, a much lower figure was given of 5·9 per cent, which did not change appreciably between 1930 and 1939.

[d] Estimated by Balogh, *Bulletin of the Oxford Institute of Statistics*, 1947, as comparable with the figure of 11·6 for 1938. Apparently this is a gross figure including maintenance. Marschak and Lederer estimated depreciation only, excluding maintenance, at 3 per cent of gross national product.

[e] Estimated by Mukherjee and Ghosh for 1949.

[f] Norway's definition, as has been pointed out, appears to be more "gross" than that of other countries. The figures for gross investment for earlier years given in Table X should also be regarded in this light, and a deduction of about 15 per cent of gross national product made in order to reduce them to net figures, judging by Wedervang's statement (*Weltwirtschaftliches Archiv*, January 1931) that net savings constituted 15 per cent of national income in 1913.

[g] This figure stood at 7·6 in 1925, 7·8 (or 1·90 per cent of capital) in 1913, 6·7 per cent 1900 to 1910.

[h] Earlier figures as given by Cairncross are as follows:

	Per Cent of Gross National Product	Per Cent of Capital
1911–13 . .	8·2	3·06
1903–7 . .	5·9	1·87
1893–97 . .	6·7	2·22
1883–87 . .	7·0	2·11
1873–77 . .	7·3	2·59

[i] Professor Kuznets (National Bureau of Economic Research, *Occasional Paper 6*) states that repair and maintenance of capital goods, which can be distinguished from depreciation and depletion, require in normal years an amount equal to somewhere between 5 per cent and 7 per cent of net national income, more than half of which represents the maintenance of roads and other public properties. In the same Paper he estimates depreciation for 1939 about 6 per cent higher than that given above. For the 1920s his method gives a considerably higher figure. Depreciation as he gives it in *National Product Since 1869* is as follows:

	Per Cent of Gross National Product	Per Cent of Capital
1900–28 . .	11·3	4·65
1909–18 . .	10·5	4·95
1899–1908 .	9·4	4·15
1889–98 . .	9·7	
1879–88 . .	8·2	5·42
1867–78 . .	9·7	

are differences of definition between different countries, although, on the whole, we should expect the simpler and more agricultural economies to have a lower depreciation rate than the more advanced industrial countries.

As time goes on the defects in the post-war figures, due to the change in price-level, tend to be reduced. The more short-lived of the pre-war assets have already been replaced, and the longer lived assets (mainly buildings) tend gradually to change hands by purchase, at a price more nearly representing their real value, and the purchaser is presumably allowed to charge depreciation on that. Even so, we must consider the present-day figures undervalued, and must expect some further rise as the remaining pre-war assets are scrapped or replaced.

The available information on the composition of gross investment is given in Table XII. The classification by nature, between buildings, constructions, equipment and stocks, cuts across the classification by object, i.e. agriculture, manufacture, etc. In the very imperfect state of the table as it now stands, we can see the large claims made by transport and public utilities. Manufacture generally only claims about one-quarter of the available *gross* investment but in some circumstances more. Up to

NOTES FOR TABLE XII

[a] Not housing or agriculture, and not included in figures which follow.

[b] Of which 45 per cent working capital, 18 per cent equipment, 37 per cent buildings.

[c] All buildings other than factories.

[d] Imported equipment only.

[e] All public works.

[f] Including commerce and services.

[g] From *Economic Survey*, 1954.

[h] Commissariat Général du Plan (*Economist*, 11th June 1949). *Net* investment totalling 715 billion francs. "Commerce" includes "light industry".

[i] From *Sonderheft* 22 of Institut für Konjunkturforschung. Excluding net additions to stocks.

[j] Commerce included with manufacture, and mining with public utilities.

[k] Terborgh, *Federal Reserve Bulletin*, September 1939, for all figures up to 1938.

[l] The estimate for 1863 showed dwellings constituting about 30 per cent of *net* investment for that year.

TABLE XII

Percentage Composition of Gross Investment

	Buildings and Structures	Equipment	Stocks	Agriculture	Manufacture and Mining	Railways	Other Transport and Communication	Commerce and Services	Public Utilities	Housing	Government
Belgium, 1947	..	..	..	3	28	12	16	7	..	19	16
Canada, 1952	..	..	..	12	22	5	..	13	19	15	15
1938	31 [a]	..	14 [a]	9	..	4	..	..	14	14	19
1929	..	..	..	..	21 [f]	16	..	..	11	21	13
1901–11	..	..	..	15	28 [b]	27	4	..	..	27 [c]	..
Chile, 1940	35	28 [d]	..	..	..	..		..	..	..	24 [e]
Cyprus,[g] 1953	..	..	..	12	29	13		4	..	42	
Denmark, 1949	45	46	9	..	..	..		..	..	..	..
1939	..	..	..	12	24	23		8	..	22	13
1930	..	..	..	12	23	25		9	..	22	8
France, 1928–30	46	..	..	..	..	75		..	..	29	6
1948 [h]	..	..	..	12	14	8	15	14	12	22	3
Germany,[i] 1928	..	..	..	6	23	15		4	8	24	20
net	..	..	..	4	16	13		7	10	28	22
Israel, 1950	..	..	..	14	15	2	14	..	..	38	14
1936	46	..	..	..	..	..	..	..	..	..	..
Italy, 1950	..	..	..	13	40	10	10	..	..	15	12
Japan, 1936	54	46	..	..	..	..	..	..	..	..	..
Netherlands, 1952	..	..	..	6	41	16		6	..	20	11
Norway, 1953	..	..	..	9	18	4	24	11	6	19	9
1938	..	..	..	13	17	30		6	4	20	10
Sweden, 1948	56	..	..	8	28	4	9	..	7	20	24
1938–39	..	..	..	8	24	..	..	..	..	28	..
United Kingdom,[j] 1948–53	..	..	..	3	39	14		..	14	26	5
1935–38	..	..	..	1	33	15		..	10	36	5
1930–34	..	..	..	1	28	15		..	12	38	6
1925–29	..	..	..	1	28	23		..	12	32	4
1911–13	..	..	..	..	..	41		..	..	10	7
1894–96	..	..	..	..	..	25		..	..	34	8
1870–72	..	..	..	..	..	32		..	..	33 [l]	5
United States,[k] 1952–54	61	38	1	..	21	2	2	..	7	20	18
1934–38	..	..	..	7	23	3	..	15	9	13	30
1929–33	..	..	..	5	20	5	..	17	12	15	26
1924–28	..	..	..	5	18	5	..	15	10	30	17
1919–23	..	..	..	8	28	6	..	15	5	24	15

one-third of all available gross investment is devoted to housing.

An interesting statement by Mr. K. N. Raj, in a paper at the World Population Conference, indicated that it was expected in India, as capital formation increased (rapidly it was hoped) over the next decade, that at least half of all the available gross investment would have to be devoted to " economic and social overheads ", i.e. transport, public utilities and Governmental investment. This is an interesting and carefully judged conclusion. Neglect of these " overheads " in the belief that all available investment could be devoted to increasing manufacturing capacity has led to some serious mistakes, in India (as in the once-famous " Bombay Plan " of 1945) and elsewhere.

Both capital formation and capital stock figures, it will be seen, are still too inadequate for any sort of general review. In the comparatively few cases for which we have both capital stock and capital formation figures over a reasonable period, and we try to reconcile them, we find considerable discrepancies, which may be due to errors in the published data, or to the inadequacy of the general price index for converting money figures to real terms, or to the uncertainty of the measures of depreciation.

Thus in Canada, if we take the capital stock of 1914, and the known rate of net investment in the first decade of the century, and try to calculate back to the capital stock of 1900, we get an improbably low figure. On the other hand, adding the estimated net capital formation for the fifteen years after 1914 gives us a reasonably close figure for capital stock in 1929. If we care to proceed further forward, it appears that Canada's capital stock is now about 41 billion I.U. or 3·75 times the net national product at market prices.

In France, if we take the estimate of capital stock in 1893 as our pivotal point, and calculate backwards and forwards by adding or subtracting net capital formation, we reach a figure for capital stock for 1878 which is improbably high and a figure for 1913 which is much lower than that currently estimated. If we are going to

blame the figures of net capital formation, we must conclude that they were too high before 1893 and too low after that.

For the Netherlands we have figures of capital stock for 1893 and 1939, and the apparent gain between these two dates is 14·2 billion I.U., whereas the cumulation of net capital formation is only some 8·5 billion I.U. The capital figure for 1893 was over six times the national product at that date and it is difficult to raise it any higher. Possibly the figure for depreciation is excessive; or we should introduce (here and in some other cases) a factor for the *increment* in real value of old buildings, whose replacement value rises with the relative rise in building prices compared with other prices.

For Norway likewise, comparing 1884 and 1939, the cumulation of estimated net capital formation is not nearly adequate to explain the growth in capital stock, nor would it be if we *double* the 1884 estimate of capital stock.

In Sweden, on the other hand, when we compare 1885 and 1913, the cumulation of capital formation figures gives us an over-estimation for capital stock in the latter year.

For the U.K., however, the cumulation of capital formation figures as given under-states capital growth, as shown by the capital stock figures, between 1865 and 1895, but over-states it after that date. It may be that the figures for depreciation used by Professor Cairncross are inadequate after 1895. This applies also to other estimates of depreciation which have been made for the 1920s and the 1930s. If we take Mr. Redfern's capital stock as estimated for 1938 and carry it back, by means of the best available estimates of net capital formation, to 1928 or 1914, we get improbably low figures.

In the U.S. the two methods of calculation from capital stocks at benchmark dates, and from capital formation continuously, have been to some extent checked against each other. Nevertheless, if we take the capital stock of 1939 and calculate backwards with Professor Kuznets's net capital formation figures, we get results which are somewhat

too low, the discrepancy becoming worse with each succeeding decade. In other words, Professor Kuznets's figures are somewhat too high, though perhaps he has not adequately allowed for depreciation.

If any more precise calculations of this nature are to be made, one factor which we will require to know is the extent of real capital loss during the war years. On this

TABLE XIII

War-time Losses (Billions of I.U.)

Albania	0·33
Belgium	2·52 [a]
Bulgaria	0·47
Czechoslovakia	4·66
Denmark	0·18
France	23·45 [b]
Germany	not estimated
Great Britain	7·09
Greece	2·83
Hungary	4·80
Italy	3·22 [c]
Luxembourg	0·20
Netherlands	4·36 [d]
Norway	1·40 [e]
Poland	30·90 [f]
Roumania	0·76
United States	0·52
Yugoslavia	11·67

[a] De Visscher (*International Affairs*, January 1946) estimates the destruction of property at only 8·1 b., but also 2·2 b. for losses on "clearing account" and 2·6 b. for payment of occupation costs. One element in these two latter presumably represents the loss of stocks of goods.

[b] This is a high figure, but it is substantiated from other sources. Blum, in an official statement (*Economist*, 6th April 1946), estimated direct destruction at 18·8 b. and loss of stocks at 2·4. In addition, equipment removed, some of which may have been returned, was estimated at 12 b. and deterioration through under-maintenance at 6·4 b.

M. Bettelheim (*International Labour Review*, 1945) records the destruction of housing at 250 m. sq. metres or 14 b. I.U., which should be multiplied by a factor of 1·5 to include other buildings. The Ministry of National Economy, however (*International Labour Review*, November 1945), estimated that repair of destroyed structures would require 14 b. man-hours, which is only worth 6 b. I.U. on the average productivity of a French man-hour; but we may estimate it at a higher figure if we assume that France has a higher relative productivity in the building trades than in production in general.

[c] An official statement (see *Economist*, 10th November 1945) puts the figure at 22 b. I.U., comparable with France. This certainly looks more plausible.

[d] In the official estimate it was considered that this was approximately 25 per cent of the capital stock of 1939.

[e] This is approximately confirmed by the more detailed estimates published in *Nasjonalinntekten i Norge*, and in the Budget speech of 1946. Actual damage amounted to 0·45, loss of stocks to 0·30, and the remainder represented under-maintenance of capital assets. During the war period foreign assets *rose* by 0·5 b. I.U.

[f] Including 8·65 b. on territory which was Germany in 1939 and is now part of Poland.

we have a useful summary of official estimates [1] expressed in dollars of 1938 purchasing power and converted to I.U.s. Countries where the figure was trivial are omitted. It appears that these figures are meant to cover actual destruction of buildings, construction, equipment and shipping, and loss of stocks of goods ; but not, apparently, deterioration of assets through under-maintenance or loss of external capital holdings outside the country.

Apart from the figures quoted above, there remain a few other isolated data of net savings.

TABLE XIV

Other Data of Net Savings as Percentage of National Income

Greece	1891	10·0	De Foville, *Journal of the Royal Statistical Society*, 1893
Ireland	1926	9·0	Kiernan, *Journal of Statistical and Social Inquiry of Ireland*, June 1933
Jamaica	1938	5·0	Professor Lewis, *Agenda*, November 1944
N. Rhodesia	1938	5·4	Deane, *Studies in Income and Wealth*, vol. 8
Poland	1938 1946	17·0 23·0	*Economist*, 12th October 1946 (apparently gross savings)
Russia	1913	10·2	Professor Prokopovicz,* Birmingham University Bureau of Russian Studies
Spain	1913 1940	7·7 13·4	Von Beckerath, *Weltwirtschaftliches Archiv*, July 1931

* Estimated annual rates of saving 300 m. R. per year 1890–99, 1000 m. R. per year 1900–1913, 1500 m. R. in 1913.

As is seen from the above evidence, and particularly from our failure to reconcile supposed rates of net capital formation with supposed figures of capital stock at different dates, we are bound to conclude that we do not yet have sufficient accurate figures of net saving to make any thorough analysis of the factors which determine it. In present-day Britain, for instance, a lot of effort is being

[1] *Études et Conjoncture*, July 1947 and September 1948.

expended in attempting to explain the fluctuations of a supposed " personal savings " figure which is not net at all but gross of depreciation on non-corporate business assets, housing, etc. Most of the information which we have is in gross rather than net form. Where we have moderately good information over a long period, as for the U.S., we find a general tendency for the ratio of net savings to net income to be comparatively constant over a long period.

In making any precise comparison of net savings in different countries in different times, there are further factors which we must take into account, arising out of public finance. When a country collects a substantial revenue in death duties, these are generally paid by the sale of assets in the market, and the purchase of these assets has to come out of somebody's net saving. So we should add the proceeds of death duties and similar taxation to net savings as estimated from net capital formation and the balance of payments. (A small annual tax on capital, on the other hand, such as is imposed in the Scandinavian countries, is probably paid out of revenue, and should not be treated in the same way as death duties for this purpose.)

Capital formation has hitherto been estimated from the formation of physical assets. If a Government borrows to construct such assets we have included them in our reckoning, but if a Government borrows to meet a revenue deficit, this again represents a call upon net savings, and the amount of such borrowing should be added to the figure already calculated.

But there is another factor at work causing dispersion of the results, namely, the age composition of the population. Savings are generally accumulated by the young and decumulated by the old, so a rapidly growing population with a high proportion of young men should have a high rate of accumulation, an elderly population a low rate.

It may well be that this factor plays a considerable part in determining the rate of saving.

That the proportion of income saved should not change very much over a long period in which real income per

head is increasing, is at any rate sufficient evidence to discount the crude " stagnationist " theory.[1]

That the proportion of national income saved should remain constant, as real income rises, means that at any

TABLE XV

PERSONS OVER 60 AS PERCENTAGE OF PERSONS 20–39

France	1866	37
	1911	41
	1938	52
Germany	1910	26
	1925	28
	1939	39
Great Britain	1871	26
	1911	27
	1937	41
U.S.A.	1890	18
	1920	23
	1940	32
Canada	1911	22
	1938	30
Belgium	1938	47
Switzerland	1930	33
Netherlands	1909	31
	1937	33
Japan	1913	19
	1935	26

given level of real income for an individual the proportion saved must be falling through time (whether due to changing age composition of the population or for any other reason): for if this proportion remained constant in the

[1] In the U.S., but probably not elsewhere, such a theory might be called Keynesian. The theory is that in the long term, as real income per head develops, an increasing proportion tends to be saved; that this tendency may be masked for a time by wars, rapid population growth, or settlement of new territory; but that in the end it is bound to lead to economic stagnation and unemployment. Whether Keynes actually said or thought this is debatable. His *General Theory* was almost entirely concerned with short-period relationships, and he made this quite clear. But it is true that there are one or two passages in which he implies that the theory may have a long-period application, such as the famous passage about the Ancient Egyptians building pyramids. In this respect, perhaps, Keynes's taste for a *bon mot* led him astray; such a theory is as clearly inapplicable in the long period as it is applicable in the short period.

long period, a general rise in real incomes would raise the proportion saved.

TABLE XVI

PERCENTAGES OF INCOME SAVED

	Real Income I.U. per Year per Family											
	300	400	500	750	1000	1250	1500	2000	3000	4000	5000	7500
Japan 1926–27 : farmers .	−3	3	11	23	..	..	..	..	..	..	..	..
,, wage-earners	8	12	13	18	..	..	..	..	..	..	..	..
,, salaried .	..	0	3	7	11	12	14	..	..	..	..	..
U.S.A. urban 1901 . .	..	..	..	−3	5	10	13	18	33	..	..	..
U.S.A. urban 1917–19 .	..	..	..	..	3	6	9	13	16	..	..	..
U.S.A. 1935–36 : farmers .	..	..	..	..	..	−1	5	14	28	35	44	..
,, rural non-farm	..	..	..	..	..	−1	1	4	11	15	22	36
,, urban . .	..	..	..	..	..	−4	−1	1	8	13	16	20
,, urban 1941 .	..	..	..	..	−1	0	1	2	6	10	..	..

These conclusions are confirmed in a striking study by Dorothy Brady and Rose Friedman (*Studies in Income and Wealth*, vol. 10), who show : (i) the shift of the curve with time ; (ii) urban–rural differences ; but also (iii) that the data are to a considerable extent brought together again when we consider the proportion of income saved as a function, not of the absolute level of real income, but of relative position in the income scale.

TABLE XVII

PERCENTAGES OF INCOME SAVED

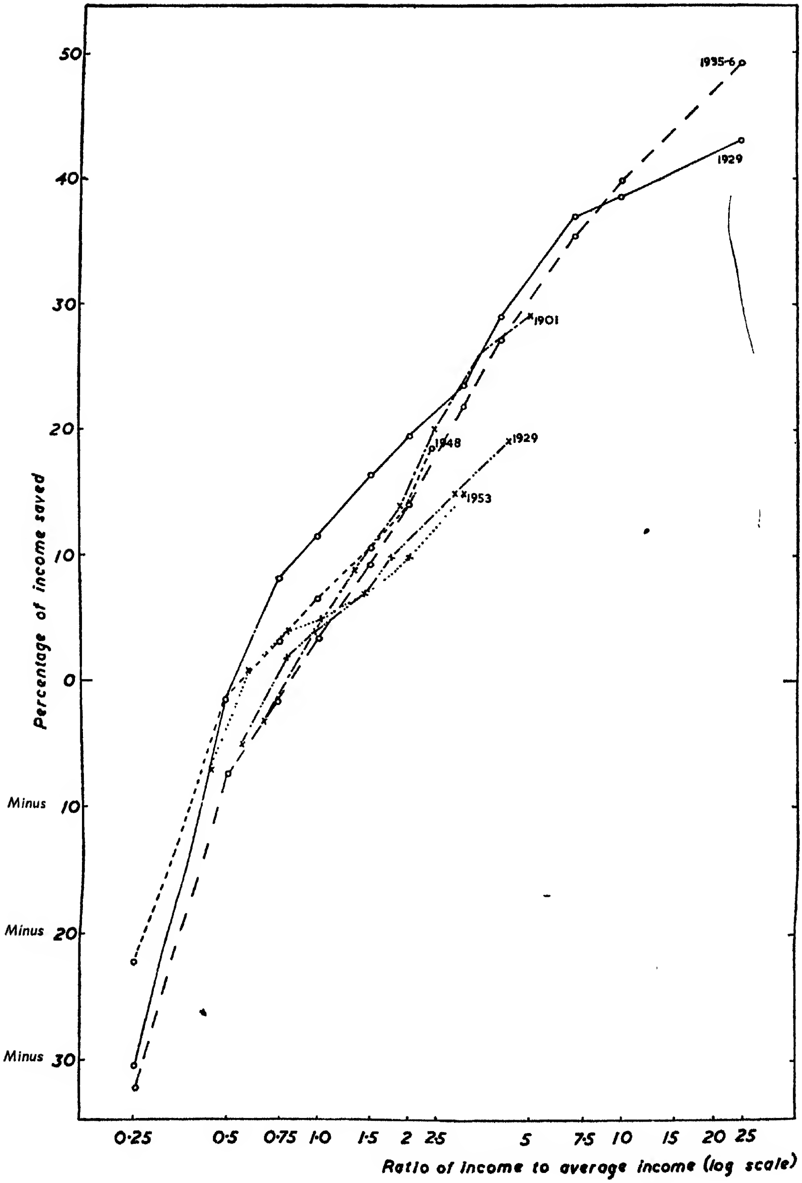
	Lower Point of Income Range as Percentile of Total Number of Incomes												
	50	70	80	85	90	92·5	95	97	98	98·5	99	99·25	99·5
U.S.A. urban 1901 .	..	..	5	8	12	14	18	23	30	..	..	..	..
,, ,, 1917–19 .	..	..	2	4	9	11	14	..	..	..	..	..	..
,, ,, 1935–36 .	−2	2	5	7	10	12	15	18	20	21	..	..	..
U.S.A. rural non-farm 1935–36	..	2	4	7	10	11	14	22	28	32	39	..	..
U.S.A. rural 1935–36 .	..	4	11	15	20	23	29	35	40	43	48	51	53

This theory of saving has been advocated by Mr. Dusenberry in *Income, Saving and the Theory of Consumer Behaviour*. His theorem might now be regarded as almost

the antithesis of the Keynesian theorem. An interesting counter-attack has been made by Mr. Tobin in his book *Money, Trade and Economic Growth.* He sets out to defend what we must now call the old-fashioned Keynesian theorem that savings depend upon absolute income level, against the new Dusenberry theorem that they depend upon relative income level. One of Mr. Dusenberry's principal points was that in the U.S., at a given level of income, a coloured man will save more than a white man because, Mr. Dusenberry contends, he is higher up the relative income scale (relative that is to say, among people he is likely to mix with) than the white man. Mr. Tobin shows on the other hand that the higher average rate of net saving by a coloured man at any given income level is fully explained by the fact that he makes less dis-saving because, on the average, he has fewer assets which he can dispose of or borrow on. Mr. Tobin makes further studies of the expenditure of farm families for the period 1940–42, which do not provide very strong evidence, as it was an abnormal period and certain commodities were hard to get. In comparing urban and rural saving Mr. Tobin makes the minor but definite point that we should take account of the lower level of prices in the country, so that the same money income represents a higher real income for the countryman. But he goes on to make a systematic comparison of inter-city differences, and shows that the hypothesis that savings depend on absolute incomes gives a better fit than the relative income hypothesis. On the face of it, the absolute income hypothesis is quite incompatible with the relatively constant savings/income ratio over a long period of growth. Mr. Tobin has suggested that this, too, might be explained if we assume that saving is a positive function of absolute real income but also a negative function of assets already held. Mr. Stone has followed up this suggestion and has presented an interesting model in a paper to the World Population Conference in 1954.

Miss Brady on the other hand suggests [1] that the

[1] Private communication, 4th September 1951.



Points indicated by circles o from the National Bureau of Economic Research, *Occasional Paper 35* (quoting Brookings Institute for 1929, Consumer Purchases Study for 1935–36, Survey of Consumer Finances for 1948) (income excluding capital gains, *before taxes*). Points indicated by × from *Fortune*, August 1954 (income *after* taxes).

difference in saving between rural and urban families at the same income level, or families at different dates, can be fully explained in terms of absolute real income level and year-to-year variability of income, which of course is higher for farmers than for industrial workers. This hypothesis is also supported by Professor Katona [1] and by Professor Milton Friedman.

Another method of measuring the same phenomenon is to express each income as a multiple of the average family income. This has been attempted by the National Bureau of Economic Research, and also by the periodical *Fortune*, which, however, does not quote its sources. There is unfortunately, as can be seen from the diagram, a considerable discrepancy between the two sets of figures, which is heightened when we take into account the fact that the *Fortune* figures are estimated after taxation, but the National Bureau of Economic Research figures before (unless we assume that capital gains which are included by the National Bureau of Economic Research and excluded by *Fortune* outweigh taxation at the higher income levels). Both sources, however, appear to indicate that there has been some decline in the proportion of income saved, not only at a given level of absolute income, but also at a given level of relative income, as measured by the ratio of income to the national average.

[1] *Review of Economic Statistics*, May 1949.

CHAPTER XII

DISTRIBUTION OF INCOME BETWEEN FACTORS OF PRODUCTION AND BETWEEN PERSONS

THE measurement of the distribution of the net national product between factors of production has always presented great practical difficulties, owing to (1) the lack of a clear distinction between "wages" and "salaries"; (2) the presence of a large intermediate group of small working proprietors and the question of whether to classify their income as wages, profits or interest; (3) the same problem in a more acute form in the case of small agricultural proprietors, often employing family labour, and also often obtaining a considerable amount of income in kind.

These difficulties can be overcome, and a useful analysis obtained for a number of countries, by adopting the following principal of measurement:

(1) The distribution of the net agricultural product and the net non-agricultural product should be regarded as two entirely separate problems, to be analysed separately.

(2) That it is not practical, at any rate at present, to make any distinction between wages and salaries.

(3) That in the case of all working proprietors (employers and independent workers) it is reasonable to impute that their income contains an element representing the remuneration of labour equal to the average per head earnings of the whole body of wage and salary earners.

(4) That it is also not practical, at present, to separate the remuneration of capital as such from the remunerations of effort and risk.

The tables which follow show the apportionment of non-agricultural income in a number of countries. In nearly all of them agricultural income now represents a relatively small share of the whole.

The first step is to obtain net national income at factor cost, to deduct from it net external income (which means making an addition in the case of some countries), and then to deduct the whole net income produced by agriculture.

Next is analysed (generally from tables in the *International Year Book*) the non-agricultural labour force. Unpaid family helpers who constitute such a serious statistical problem in agriculture are of minor importance in non-agricultural activities. This labour force includes a certain number of employers and independent workers, and the balance will represent wage and salary earners.

The analysis can be made for nearly all countries which provide official estimates of the total of wages and salaries. These generally specify agricultural wages separately, but in a few cases an estimate has to be made from numbers employed and wage rates.

This total of wages and salaries is then raised to include the imputed remuneration of the ordinary labour performed by employers and independent workers. It might be contended that this adjustment is hardly necessary; but when we have to compare times and places in which the proportion of such workers to the whole labour force varies considerably, this adjustment is certainly called for.

In effect, where the total paid in non-agricultural wages and salaries is w, the whole labour force is l, including e employers and independent workers, then the total remuneration of labour including imputed remuneration is

$$\frac{wl}{l-e}.$$

It now only remains to express this as a proportion of the entire net national product.

It is interesting to see that countries where labour receives the highest share of the product are France and the U.S., where it is now over 80 per cent, but that there are a number of other countries in which the figure is in the neighbourhood of 75 per cent. The lowest ratios are found in Mexico and Chile and it is probable that labour receives throughout Latin America a low share of the

[*contd. on p.* 620

TABLE I

	Australia £ mill.			Austria bill. Sch.	Belgium [g] Frs.		Canada $ bill		Chile bill. Pesos		Finland bill. Marks	
	1938–39	1952–53	1954–55	1951	mill. 1913	bill. 1951	1938	1952	1940	1950	1938	1952
Net national income at factor cost	780	3588	4033	..	7250	345	4·02	18·31	16·4	110·8	29·6	608
Do. less net external income	820	3643	4109	55·6	7000	344	4·26	18·61	17·9	115·0	29·7	623
Do. less agricultural income	730	2954	3483	46·8	6266	315	3·71	16·00	14·8	96·8	18·9	466
Labour force excluding agriculture, millions	2·23	2·74	2·92	2·27	2·68	3·06	3·44	4·29	1·12	..	0·86	1·07
Of whom employers and independent workers	0·28	0·32	0·32	0·28	0·48	0·54	0·34	0·43	0·28	..	0·13	0·11
Wages and salaries	445	2040	2321	31·7	2816	162	2·50	11·01	7·2	51·5	14·8	382
Do. excluding agriculture	407	1970	2241	30·4	2611	160	2·41	10·68	6·1	41·6	13·1	347
Do. including imputed wages of employers and independent workers	463	2225	2517	34·7	3178	194	2·67	11·87	8·1	55·5	15·4	387
Labour's share of net income, per cent	63·5	75·6	72·1	72·0	50·6	61·6	72·0	74·2	54·6	57·4	81·5	83·0

	France bill. Frs.					Germany bill. Marks			W. Germany bill. D-marks	Ireland £ mill.		Japan bill. Yen	
	1885 [m]	1913	1929	1938	1952	1913	1928	1936	1953	1938	1952	1951	1934–35
Net national income at factor cost	23·5	36·1	270	327	10,190	46·3	80·0	73·5	103·0	154	406	..	..
Do. less net external income	22·3	34·2	265	323	10.190	45·3	80·6	74·0	104·0	148	397	14·5	4849
Do. less agricultural income	14·3	23·8	205	261	8.690	38·8	73·2	66·9	92·9	111	274	11·7	3793
Labour force excluding agriculture, millions	10·7	11·8	13·91	13·04	13·04	16·60 [o]	23·53 [n]	..	16·96	0·62	0·72	14·6 [l]	19·03
Of whom employers and independent workers	2·0	2·5	3·46	3·42	3·15	3·10	3·58	2·85	2·01	0·09	0·09	4·31	3·65
Wages and salaries	9·1	15·7	107	157 [p]	5,796	20·7	42·6	35·3	59·7	79	204	5·7	2138
Do. excluding agriculture	7·1	13·7	91	139	5.581	19·9	41·0	33·7	57·9	71	189	4·7	2090
Do. including imputed wages of employers and independent workers	8·7	17·4	121	189	7.360	24·5	48·3	37·9	65·6	83	216	6·5	2570
Labour's share of net income, per cent	60·7	73·2	59·0	72·5	84·7	63·2	65·9	56·6	70·7	74·7	78·9	55·1	67·9

	Mexico bill. Pesos		Netherlands bill. Guilders		New Zealand £ mill.		Norway mill. Kr.			Poland [r] mill. Zloty		Puerto Rico $ mill.		Switzerland mill. Frs.		
	1939	1949	1938	1949	1938–39	1951–52	1930	1939	1950	1929	1933	1939	1951	1938	1948	1952
Net national income at factor cost	5·74	31·26	4·90	14·11	228	609	..	..	..	23·5	15·2	228	891	8465 [b]	16,846 [b]	19,200 [b]
Do. less net external income	5·82	31·45	4·50	13·71	235	615	3575	5032	12,946	23·9	15·4	232	911	8335	16,776	18,900
Do. less agricultural income	4·64	25·53	4·16	11·84	175	451	2958	4421	11,001	12·9	9·95	160	735	7557	15,206	17,250
Labour force excluding agriculture, millions	2·03	..	2·52 [l]	3·12	3·46	0·52 [k]	0·72	0·89	1·08	4·79	5·63	..	0·37	1·58 [i]	..	..
Of whom employers and independent workers	0·88	..	0·40	0·47	0·06	0·05	0·16	0·18	0·18	1·06	1·25	..	0·06	0·23	..	..
Wages and salaries	..	..	2·53	7·56	112	335	1733	2490	6.942	8·4	6·7	123	553	3977 [b]	9,591 [b]	11,100 [b]
Do. excluding agriculture	1·77	7·40	2·28	7·06	99	320	1543	2318	6.433	6·8	5·95	95	463	3802	9,256	10,750
Do. including imputed wages of employers and independent workers	3·12	13·08	2·69	8·25	114	353	1984	2900	7,730	8·75	7·65	112	545	4445	10,820	12,570
Labour's share of net income, per cent	67·2	51·2	64·5	69·6	65·1	78·2	67·2	65·5	70·2 [j]	67·7	76·8	70·0	74·1	58·8	71·2	73·9

	United Kingdom [c] £ mill.					United States $ bill.						
	1880	1911	1924	1938	1952	1919 [a]	1926 [a]	1929 [a]	1929	1939	1949–51	1953
Net national income at factor cost	1073	2140	3919	4796	12,626	..	..	..	87·2	71·0	240·3	299·5
Do. less net external income	963	1932	3699	4568	12,565	..	..	..	86·4	70·7	238·7	297·8
Do. less agricultural income	813	1790	3546	4412	11,812	55·0 [b]	75·3 [b]	80·1 [b]	78·4	64·6	220·5	280·8
Labour force excluding agriculture, millions	12·45	17·72	19·10	19·8 [g]	21·46	31·33	34·50	36·71	36·83	38·14	52·71	..
Of whom employers and independent workers	1·54 [d]	2·19	1·65	2·16	1·22	2·98	3·41	3·62	4·65	4·80	5·96	..
Wages and salaries	503 [e]	996	2342	2913	8.565	..	..	..	..	..	..	..
Do. excluding agriculture	450	932	2285	2847	8,292	35·6 [b]	46·7 [b]	50·9 [b]	49·3 [b]	43·1 [b]	150·1 [b]	200·4 [b]
Do. including imputed wages of employers and independent workers	514	1063	2501	3195	8,791	39·5	51·8	56·5	56·4	49·3	169·2	225·2
Labour's share of net income, per cent	63·2 [f]	59·5	70·3	72·2	74·4 [j]	71·9	68·8	70·5	71·9	76·3	76·8	80·1

[*Notes overleaf*

product. The figure for Japan was low in the 1930s, but is much higher now. The lowest ratios in Europe are for Belgium and Norway — both, it may be added, countries where there is a considerable proportion of heavy industry where capital requirements may be unusually high.

In Latin America, not only is labour's share of the product low, but its trend still seems to be downwards, as is shown by a number of data of the last report of the Economic Commission for Latin America. In most other countries the trend is upwards, though there are some interesting exceptions. In France, labour's share of the product seems to have fallen heavily between

NOTES FOR TABLE I

[a] Data from Professor Kuznets's *National Income and its Composition*: definitions differ slightly from those of Department of Commerce.

[b] Excluding employers' contributions to social insurance.

[c] Includes all Ireland up to 1911, Northern Ireland thereafter.

[d] Direct data not available: we assume (as Sir Arthur Bowley does) that their ratio to labour force was similar to that of 1911.

[e] Sir Arthur Bowley (in *Wages and Prices Since 1860*) gives £430 millions for wages. For salaries above £150 Giffen (in *Progress of the Working Classes*, 1884) gives £33 millions. Non-manual workers (*Wages and Prices Since 1860*, pp. 128-9) numbered 1·87 millions in England and Wales, or 2·3 millions in U.K., of whom 1·54 millions were employers and independent workers, and 760,000 salaried workers. The salaries above £150 already covered numbered some 160,000, leaving 600,000 lower salary earners at an average salary of £66, or an income of £40 millions.

[f] Some tentative calculations for 1843, using Giffen's data, also indicate a ratio of about 63.

[g] Data for 1931.

[h] Preliminary indications are that for 1953 the ratio fell markedly, to 72·6.

[i] 1941 figures.

[j] More recent figures show that this ratio had not changed appreciably by 1952.

[k] 1945.

[l] 1930.

[m] From paper submitted by M. Mayer to the 1951 Conference of the International Association for Research in Income and Wealth.

[n] 1925: includes family workers with employers and independents.

[o] For 1907, very approximate.

[p] Mean of Dugé de Bernonville and Fromont-Gavanier estimates (as for National Income).

[q] *Bulletin de Statistique*, December 1946.

[r] Birmingham University Bureau of Slavonic Research, 1934. Income is defined to exclude Government services.

Text and table from author's paper to the International Association for Research in Income and Wealth, Hindsgavl, 1955.

1913 and 1929. In Germany there was a marked fall in 1936. In Britain there was a slight fall between 1880 and 1911.[1]

It will be appreciated that the remainder of the net national product, ranging from 45 per cent in some Latin American countries down to 20 per cent or less in some others, must represent the combined net remuneration of capital, enterprise and risk-taking. The downward tendency of this proportion in most countries is clear. But it is equally clear that it is unlikely to disappear altogether. One might even ask, *a priori*, if it is conceivable that this figure should fall much below 20 per cent.

In a country where labour already obtains 80 per cent of the net national product, even if no further rise in this ratio takes place, assuming that real product per man-hour is rising at the rate of 2 per cent per annum, we reach the interesting conclusion that labour has as much to gain, in the way of real income, from ten years' normal development as it could obtain by the complete expropriation of all the income of capital and enterprise now (this is assuming that this latter operation can be performed without reducing production).

In many of the countries in which labour's share is high it will be noticed that the proportion of the net product available for the remuneration of capital and enterprise is now approaching the order of magnitude of the proportion of the non-agricultural force who make a living by enterprise rather than as salary or wage earners. In France the ratio is actually higher, i.e. average income per head among entrepreneurs is lower than among wage and salary earners — and might be lower still if agriculture were included. But, as is well known, there is a much wider dispersal of income among entrepreneurs than there is among wage and salary earners.

The distribution of the product of industry between

[1] Sir Arthur Bowley's well-known result, published in 1920, which apparently indicated that the share of labour had remained constant between 1880 and 1913, is amended in the light of (1) more precise wage figures published by Sir Arthur Bowley himself at a later date; (2) the inclusion of salaries; (3) the exclusion of agricultural wages,

labour and capital used to be envisaged by many economists, with their attention concentrated upon the capital resources of large-scale industry on the one hand and an impoverished proletariat on the other, as a struggle between non-competing groups (if some perversion of the latter phrase may be permitted). The worker could not become a capitalist nor the capitalist a worker; the distribution of the product between them was held by many to be indeterminate, or settled only by relative bargaining powers.

Now that we envisage a large and increasing proportion of the national product representing the output of service industries and of small-scale manufacture, different considerations arise. The wage-earner, under certain circumstances at any rate, has an opportunity of engaging in enterprise of his own. Alternatively, if wages appear high relative to the earnings of enterprise, the small entrepreneur will cheerfully abandon his business and undertake wage work. Under these circumstances the distribution of the product will in the long run be determined by the extent of these movements into and out of the field of enterprise.

Thus, with time, and as the wage-earner's opportunities of obtaining capital, education and experience increase, he will compete more formidably with existing enterprises. The relative remunerations of enterprise and capital may be further reduced and labour may obtain more than 80 per cent of the product. On the other hand, it is clear that the process cannot go very much further. One might say, in general terms, that at least 10 per cent of the product must be reserved for the remuneration of other factors of production, if the necessary element of enterprise is to be maintained.

The changes in France are really very striking, and would repay further analysis. The working population was only rising very slowly by 1911 and has been stationary or declining since. This may have meant that land and capital became comparatively abundant relative to labour, but this cannot be the whole explanation. Nor can we attribute labour's increased share of the product to full employment; there was considerable unemployment in

1938, and virtually full employment in 1911 and 1886. It may be the case that educational opportunities and the general social climate of France make the establishment of small businesses comparatively easy. Under these circumstances the incomes of wage-earners and of business men cannot be very far apart.

Germany up to 1913 was a country in which the share of capital in the national income was very high. It seems reasonable to associate this with the highly monopolised structure which German industry had acquired even at that early date. The effect of the inflation was to destroy a number of rentier claims on production, but it apparently established others, and even in 1928 the share of labour remained comparatively low. In subsequent years the share of capital in the national income again increased (though under the Nazi regime the income of capital was subjected to a rapidly increasing degree of Government control). During this period German industry was becoming even more monopolised, and free entry into business, even in the small enterprises, greatly restricted, while trade-union rights were abrogated.

The high proportion taken by labour in Japan is very unexpected. This result conflicts strongly with what is generally believed (and is in fact the case) about Japanese factories, where very large profits are made and labour only obtains a small share of the product. What must be realised is that large-scale factories still occupy only a small proportion of Japan's working population, even in the cities. A very large part of the urban working population, including suppliers of components for the larger factories, are engaged in small-scale and household production. The proportion of small working proprietors is exceptionally high in Japan and we must conclude that under present circumstances entry into business on his own account is comparatively easy for the Japanese wage-earner.

It is admittedly the case that the proportion of the Japanese national income saved is exceptionally high, exceeding 25 per cent even in peace-time. We can only reconcile this with the high proportion of the product going

to labour if we allow that the Japanese capitalists spend very little on personal consumption, that the rural population and urban working proprietors are exceptionally thrifty and, indeed, that the wage-earners themselves save a substantial proportion of their incomes.

Japanese family budget studies for 1936–37 show that even the lowest-income families save about 5 per cent of their income, and the higher paid wage- and salary-earning families up to 15 per cent.

Unfortunately no comparison could be included for Italy, owing to lack of the requisite official figures. A private study by Professor Livi[1] for the "industrial sector" only of the Italian economy (apparently excluding most of the service industries) shows that labour received 58·9 per cent of the net product in 1938, which share rose rapidly to 85·8 per cent in 1949, falling to 82·9 per cent in the subsequent year. Between 1950 and 1954, while money national income rose 41 per cent, aggregate wage payments apparently rose about 36 per cent, so the decline in labour's share (from its very high 1949 level) may have continued.

It appears that low though labour's share is in Latin America it has in recent years been declining still further. Data from *Economic Survey of Latin America*, 1953, show that, as compared with 1948, real wages are still falling relative to real gross product per head of population.

TABLE II

INDEX OF LABOUR'S SHARE, LATIN AMERICA

		Real Wages	Real Gross Product per Head of Population
Argentine	1953	75	82
Brazil	1953	100	132
Chile	1953	100	111
Colombia	1952	104	125
Mexico	1953	92	107

Bulletin of the International Statistical Institute, vol. 133, Part 3.

In Britain, as the share of non-wage income in the national income has been declining, the relative number of people among whom it has to be distributed has been greatly increasing. Professor E. H. P. Brown,[1] including salaries with non-wage income, obtains the striking result that, while the average non-wage earner received an income 7·5 times the average wage in 1881, this ratio had fallen to 5·5 by 1911 and 3·35 by 1948.

Some curious features of income distribution in Norway were discussed by Herr Aukrust.[2] Examining the period 1930–54, he found that the wage-earners' share of the net product, which showed a slight downward trend in "commodity production and transport", showed an upward trend in "trade and services". But the most striking feature was a really marked downward trend in labour's share of the net product in the export industries, from 70 per cent in 1930–32 to 47 per cent in 1952–54. (This tendency is exaggerated by the fact that the opening years were years of severe depression in which labour's share is always high; if the study had been opened in the 1920s a different trend might have been indicated.) Moreover the ratio, which is subject to violent fluctuations in the export industries, shows very little fluctuation in industries working for the home market. Both this level, and this freedom from fluctuations, may perhaps be explained by Governmental price control keeping down profits. This in turn may be a factor diverting capital into the export industries in which high (albeit most fluctuating) profits can be earned.

In the case of Australia, Mr. Horace Brown has pointed out that a considerable proportion of the increase in labour's share of the net product is explained by the extraordinary decreases in the share of net product going to (i) net rents of houses (including imputed rents), (ii) net surplus earned by Governmental trading authorities. If these had been excluded from net income, labour's share

[1] *Oxford Economic Papers*, June 1950.

[2] International Association for Research in Income and Wealth Conference, Hindsgavl, 1955.

would have been 73·0 in 1938–39, 78·1 in 1952–53 and 75·6 in 1954–55 — a much smaller change than that shown. Rents, and charges on State railways, etc., were sectors in which, for political reasons, prices were prevented from rising as they rose in private industry: in the latter field, prices to a large extent rose with wages, and labour's share did not greatly increase.

There are few countries where the net surplus of Government trading authorities ever had the same relative importance as it has in Australia. In most countries the relative importance of rents is also less than it is in Australia, where costs of building are relatively high: in most cases it has been brought down by legal restrictions, but only for a few countries are statistics available. It appears that in no other known case has more than 2 per cent of real net national income been transferred from capital to labour by means of rent restrictions.

An interesting sidelight on the nineteenth century is given by Jeans's study[1] of labour's share of the product in coal mining:

TABLE III

INDEX OF LABOUR'S SHARE, COAL MINING

	Wages £ p.a.	As per Cent Selling Price of Coal
U.S.A.	97·25	76·0
Germany	38·3	46·5
France	43·6	48·5
Belgium	34·95	38·0
Great Britain	52·0	..

For the years for which it is not possible to make calculations such as are given in Table I it should be possible to make some extrapolation by examining the relative trend of money national income per head and of money wages. An exhaustive examination of all material

[1] *Journal of the Royal Statistical Society*, 1892, p. 626.

available in this field has been made by Professor E. H. P. Brown,[1] but alternative calculations made from other sources of material are found to show very different results. It is necessary to conclude that the use of this method for comparison is unsatisfactory, even over comparatively short periods, owing to certain problems in the construction of index numbers of wages, the changing relative importance of agriculture and other factors. Only the most tentative conclusions can be drawn from it.

In France, for instance, the calculation in Table I shows that labour's share of the non-agricultural product in 1885 was only 83 per cent of what it was in 1913. The following table, however, shows Professor Brown's computations and also those of Simiand (in *Le Salaire*) of labour's share in the non-agricultural product:

TABLE IV

Index of Labour's Share, France
(1910 base)

	Brown	Simiand
1910 .	100	100
1900 .	118	110
1890 .	121	102
1880 .	107	87
1860 .	111	92
1850 .	..	82

For the U.S., figures published by the Department of Commerce for the period 1919–29 showing the distribution of national product among factors of production, supplemented by U.S. Department of Agriculture figures for agricultural wage payments, make it possible to calculate non-agricultural wages as a percentage of national product, excluding farmers' and farm workers' incomes. (The definition is slightly different from that used previously;

[1] *Oxford Economic Papers*, June 1950.

farmers' and farm workers' incomes fall short of total agricultural income as hitherto defined because the latter includes some interest; and there may be some minor differences of definition.)

TABLE V

LABOUR'S SHARE OF NON-AGRICULTURAL PRODUCT IN U.S.A.

	As given in Table I	Computed from Department of Commerce Figures
1929	70·5	67·5
1926	68·8	67·6
1919	71·9	62·3
1917	..	57·5
1910–14	..	63·5

Computing a figure of national product per person in work, excluding agriculture, and comparing it with average non-agricultural wages,[1] we conclude that the share going to labour as it was in 1919–21 had changed little since 1900, but had risen by 7 per cent during the 1890s and 32 per cent during the 1880s (percentage of this level at the beginning of each decade). Professor Brown's figures

TABLE VI

INDEX OF LABOUR'S SHARE, U.S.A. (1890–99 base)

1859	61
1869	95
1879	98
1889	106
1904–10	96
1911–13	93

[1] From Professor Douglas's *Real Wages in the United States*, linked in 1891 to a series of earlier years given by Sir Arthur Bowley (*Economic Journal*, 1898).

(which do not exclude agriculture), on the other hand, give an impression of a rise in the 1880s followed by a fall in the 1890s, and a remarkable rise during the 1860s.

For Great Britain we have an opportunity of checking Professor Brown's method against more detailed results. The figures in Table I indicate that labour's share between 1889–1911 fell from 63·2 per cent to 59·8 per cent; Professor Brown's index falls by nearly 20 per cent in that period. It appears therefore that, in this case at any rate, his method exaggerates.

TABLE VII

INDEX OF LABOUR'S SHARE, U.K. (1890–99 = 100)

1862 .	101
1867 .	107
1870–76 .	102
1877–85 .	107
1886–93 .	103
1894–1903	98
1904–10 .	91
1911–13 .	87

The fall in labour's share appears to have begun about 1890 and to have continued fairly steadily until 1913.

Figures for Germany show a less rapid fall in labour's share:

TABLE VIII

INDEX OF LABOUR'S SHARE, GERMANY

1872–82	109
1900–07	98
1908–13	99

There is some information also for countries not covered by Professor Brown.

Data are also available for Australia :

TABLE IX

INDEX OF LABOUR'S SHARE AUSTRALIA

	Average Income per Person Engaged (Factor Cost)	Average Male Wage Rate	Ratio
	£	£	
1891 . .	139	113	·813
1901 . .	117	113	·965
1913–14 .	176	144	·819
1922–23 .	274	242	·883
1928–29 .	315	262	·833

The ratio is somewhat raised in Australia because only male wages are used and a full 52-week year assumed. Nevertheless it is clear that urban wages were already high relative to national income by 1891. It must be borne in mind, however, that the urban wage-earners then formed a much smaller proportion of the population than now.

For Belgium we have data [1] from which we can calculate real wages per hour in 1891 and 1928–29, as compared with real product per man-hour (the latter includes agriculture). At the later date, industrial real wages per hour represented about two-thirds of average net national product per man-hour; but in 1891 the average wage actually exceeded average real product. In 1891 the industrial worker was still somewhat of an aristocrat among a large number of poor peasants; now the peasants are relatively fewer and their incomes are relatively higher. Factors of this sort must be taken into account if we compare real wages with real national income as a whole.

Thus, for instance, Bolton-King [2] in 1903 pointed out that the ratio of the average industrial money wage to average money national income per head at that date was nearly 50 per cent higher in Italy than in Britain, France and Germany.

[1] Gottschalk, *International Labour Review*, vol. 25.
[2] *Journal of the Royal Statistical Society*, 1903.

Subject to this warning, a comparison for Canada is possible over the period 1901–38. The figure of real wages per hour, divided by real product per man-hour, was almost the same at the beginning of the period as at the end. But at various dates during this period, in 1910, 1926 and 1929 — years of rapid growth of the Canadian economy — the level of real wages, in relation to real product per man-hour, was about 10 per cent less than it was in 1901 or in 1938.

In Sweden,[1] real national product over the period 1750–1850 was growing faster than population, though the rate of growth of real product per head was much less than it was in the period after 1850. Between 1800 and 1850 real wages showed no appreciable rise (this was probably also the case in Britain) and most of the gains in national income accrued to the propertied classes, i.e. the land-owners, the land-owning peasants, the owners of timber and iron works, and the early manufacturers.

After 1861 Professor Brown finds :

TABLE X

INDEX OF LABOUR'S SHARE, SWEDEN
(1890–99 = 100)

1861–69	100
1870–76	93
1877–85	101
1886–93	104
1894–1903	100
1904–10	97
1911–13	94

The tendency for labour's share to decline after the turn of the century seems to have shown itself in a number of countries ; but in this case it was mild.

The share of urban land in the national income is an interesting subject which has received little study, as most records do not distinguish urban land from the structures

[1] Montgomery, *The Rise of Modern Industry in Sweden.*

erected upon it. A most ingenious method has been devised by Dr. H. W. Singer for measuring the growth of urban land values in England. All real property has to be periodically revalued for local taxation purposes, but in the years in which no revaluations are taking place, increments of accessible value enable Dr. Singer to determine the current annual valuation of new structures. By an index of building costs he converts the value of past buildings to their replacement value in the year under examination. His definition of the net income obtainable

TABLE XI

	Home-produced Income at Market Prices, £ million			Annual Net Income from Urban Land, England and Wales, £ million	Per Cent of National Income
	United Kingdom	Great Britain	England and Wales		
1688 .	..	..	45	0·2	0·4
1843 .	520	360	310	3·0	1·0
1860–69	849	785	683	15·0	2·2
1870–76	1117	1036	903	20·0	2·2
1877–85	1157	1080	944	28·0	3·0
1886–93	1300	1221	1072	41·0	3·8
1894–1903	1342	1259	1108	47·0	4·3
1904–10	1769	1672	1478	47·0	3·2
1911–13	2031	1923	1700	49·0	2·9
1929 .	4213	4140	3690	96·0*	2·6

* Valuation of 1931.

from urban land is the difference between the net income obtainable from all urban buildings and the interest on the *replacement* cost of those buildings. His data refer to England and Wales only. To obtain national income data for purposes of comparison, Scotland is excluded by use of a population factor.

It will be seen that this factor takes an increasing proportion of the national income, rising to a maximum in the period 1894–1903, and that the proportion then rapidly declines. With a rapidly increasing population, an increasing proportion of which is engaged in urban occupations, a continued rise in the share of the national income

taken by urban land rents might, on the face of it, have been expected. The factors causing the reversal of the trend appear to have been the introduction of the tram-car and cheap suburban train services about this period, followed shortly by the introduction of motor buses which considerably reduced the price of intra-urban transport in relation to the average man's income. This gave him the choice of a much larger area in which he could live and thus reduced the rent obtainable by the owners of centrally situated land.

The decline in urban land values is dramatically apparent in New York.[1] The taxable assessed value of land in Manhattan, converted to dollars of 1949–50 purchasing power, stood at 5·1 billions in 1925, 6·4 billions in 1929, 7·6 billions in 1932 and 3·6 billions in 1951–52. Not only was the real value of land falling, but also of buildings. The assessed value of buildings and structures on Manhattan, in real terms, fell 25 per cent between 1930 and 1949. The rate at which old buildings are deteriorating is not being matched by new building. This factor is partly due to the same causes as, and at the same time helps to reinforce, the downward tendency in land values. But it is still more surprising to find declining land values in the borough of Queens, a rapidly growing district whose population increased by 50 per cent during 1930–50. Nevertheless, in dollars of constant purchasing power, the total assessed value of ordinary land in Queens is now 25 per cent less than it was in 1930.

Some figures are also available for France as a whole (see Table XII).

The ratio of urban rents to national income appears to reach a maximum about 1890, and then decline. It was naturally reduced by the period of inflation and rent controls after 1913, but it is interesting to see that by 1935, after a few years of falling prices, it had again risen to 6·5 per cent. After 1936 prices again rose rapidly, and reduced this proportion.

[1] *The Financial Problem of the City of New York*, Report to the Mayor's Committee on Management Survey by Robert M. Haig and Carl S. Shoup, June 1952, pp. 123-4.

Information such as Table XII, or as Dr. Singer's, is not easily obtained, except when a proper valuation of urban land is made. These valuations only have economic significance if rents have been allowed to find their true market level without regulation or restriction (which are very widespread in the modern world) and also when prices and costs have been comparatively stable over a long period.

TABLE XII

NET INCOME FROM NON-RURAL PROPERTY
(Millions of Francs)

	Fournier de Flaix *	Simiand †	Dugé de Bernonville ‡	Money National Income, billion Francs	Rents as per Cent National Income
1789 .	280 §	..	..	3·6	7·8
1812–15 .	320	..	..	6·6	4·8
1851–53 .	..	738	..	13·15	5·6
1880 .	1800	..	..	21·1	8·5
1887–89 .	..	2090	..	24·4	8·6
1899–1900	..	2344	..	30·0	7·8
1909–10 .	..	2703	..	35·4	7·6
1913 .	..	..	2,600	36·1	7·2
1924–25 .	..	5822	7,400	179	3·2–4·1
1929 .	..	..	12,000	270	4·4
1935 .	..	..	12,500	193	6·5
1938 .	..	..	14,000	327	4·3

* *Journal de la Société de Statistique de Paris*, 1885.
† In *Le Salaire*. Factories represented 7–8 per cent of the whole up to 1910, 14 per cent in 1924–25 (their rents were probably unrestricted, while house rents were restricted).
‡ *Revue d'Économie Politique*, 1939.
§ M. Mayer (International Association for Research in Income and Wealth, 1951 Conference) put this figure at 250.

Valuations of total urban net rentals, i.e. buildings and land valued together, are available in a greater number of cases. Even here, however, we need to make sure that we are being given figures of net rent as collected. In national income statistics, interest payable by the owner of land or buildings is sometimes debited as a cost before his net rent is computed. For our present purposes we want net rent before debiting interest.

However, there is a little information to show that, in certain circumstances, urban net rents may be very high in relation to national product. Thus, in the 1880s the order of magnitude of French income per head per year was only about 600 francs. It was higher in Paris, but we can hardly put the figure above 1000. Net rent of all properties in Paris in 1889 was given by Leroy-Beaulieu at 579 m. francs or 245 francs per head of population. A good deal of this probably represented true site rent, apart from interest and depreciation costs on structures. (Gross rents were 740 m. francs, of which 305 m. were on commercial property, 23 m. on factories and the remainder residential.)

In the Pakistani province of East Bengal at the present day, average income per head of the non-agricultural population is about 300 rupees per year. In Dacca, the provincial capital (with a population of 280,000), the annual gross rental value of land and buildings, as assessed for local taxation, is as much as 125 rupees per head. Even if the average income per head in the city is well above the national average for non-agricultural incomes, this still remains a very high proportion. In the smaller cities of Bengal the average assessment per head works out at only about half what it is in Dacca.

It appears that in cities which have reached a certain level of population, and are not yet adequately provided with trams, buses or other methods of transport, sites may become extremely valuable and a large proportion of the city's income be diverted into site rents. These rents tend to fall as transport improves.

In Japan[1] the annual net rental value of all land other than farmland and forests was estimated at 629 million yen in 1930, or nearly 6 per cent of net national income — rather a high proportion.

We may now examine available data on the rent of agricultural land as a fraction of the net product; in default of the precise data which we need, we can also sometimes learn something from figures of the price of

[1] Shiomi, *Kyoto University Economic Review*, 1931.

agricultural land, and of the gross product, where the net product is not known.

A crude interpretation of some of the data given in Chapter V might suggest that, if we confine our measurements to the comparison of different regions within a country, where agricultural technique is more or less given, rather than making international comparisons, then, as the number of labour units per sq. km. of agricultural land increases, so does the gross product per labour unit fall off, in a square root relationship. (If the diagram relating product per man to density of settlement is drawn logarithmically, the line falls with a slope of about 0·5.) A fairly simple piece of mathematical reasoning tells us that, under these circumstances, we might expect the marginal product of an additional unit of labour to be half the average product.

If $y = f(x)$ is the relationship defining average product, then $y = f(x) + xf'(x)$ is the equation of the marginal curve.[1] If x is the amount of labour per sq. km., then the average product is defined by

$$y = ax^{\frac{1}{2}}.$$

The marginal product, by the above equation, will be

$$ax^{\frac{1}{2}} - \tfrac{1}{2}ax^{\frac{1}{2}} = \tfrac{1}{2}ax^{\frac{1}{2}}$$

or half the average product.

This formulation is based on the observation of comparatively primitive conditions, and a "unit of labour" under these circumstances may be taken to represent the cultivator who provides the manual labour, together with the necessary equipment, seeds, etc. In other words, half the product may be expected to accrue as a pure rent to land.

For us to expect this relationship to be fulfilled, even theoretically, we must hypothecate two further conditions: (1) that the land is already fully settled, and that the cultivator cannot gain access to any vacant land; (2) that the cultivator has to bargain for the application of his

[1] Joan Robinson, *Economics of Imperfect Competition*, p. 40.

labour in a purely agricultural economy, where he has no serious prospect of being able to sell his labour to an industrial employer. When these two conditions are fulfilled, we do in fact find rents taking up to half of the net product, or even a little more. In less densely populated countries, where there is vacant land available, or alternatively in more advanced countries, where there is industrial employment available, the ratio falls, sometimes to a very low level.

In dealing with the more agriculturally advanced countries, particularly with Great Britain, we must remember that the rent of the land usually includes the rent of buildings, not only for farm purposes as such, but also the farmer's house, all of them generally provided on a substantial scale. Certain deductions must therefore be made from them before we can estimate the true rent of the land.

A very interesting attempt at an international comparison of the data available at the time when he wrote was made by Professor Studentzky :[1]

TABLE XIII

		Gross Product £ per Hectare per Year	Man-Days of Labour per Hectare per Year	Wages £ per Day	Land Value as Multiple of Gross Product
Australia	1916 .	2·9	..	..	3·38
Canada	1910 .	3·9	4·1	..	3·05
France	1910 .	13·0	..	..	3·56
Russia	1911–15	4·5	18·7	0·1	3·40
Switzerland	1910 .	26·5	84·0	0·13	3·66
U.S.	1910 .	4·8	6·2	0·32	3·49

The results showed a curious uniformity in the ratio of land values to gross product. In the older settled countries of Switzerland and France the ratio was a little, but not very much, higher than in Canada or Australia. A ratio of 3·5 per unit of gross product represents a ratio

[1] *Archiv für Sozialwissenschaft*, 1927.

of about 4·7 per unit of net product, i.e. if the rate of interest is reckoned at 5 per cent, rents will be taking $23\frac{1}{2}$ per cent, of net product, under these circumstances.

It is not yet possible to prepare a systematic tabulation of the available information, and it will therefore be presented country by country.

Brazil.—The State of São Paulo, which is by far the most agriculturally advanced region of Brazil, has a density of about 4·2 men per sq. km. of agricultural land, with an average product of about 400 I.U. per head net, or, say, $500 per head at prices of 1943–44, in which year they paid an average rent of $2 per acre,[1] or about $120 per man, i.e. some 25 per cent of net product.

Bulgaria.—In the Census of 1926 [2] it was shown that land values, in relationship to gross product, were not high, except on the larger holdings.

TABLE XIV

Size of Holding in Hectares	Ratio of Land Value to Gross Product
Under 2	0·8
2–10	1·9
10–30	3·7
30–100	3·8
Over 100 *	4·5

* Mostly forest.

Canada.—The data in the *Official Year Book* indicate that the price of farm land, both in 1921 and 1936, represented only about two years' gross product, perhaps three years' net product. Data relating the price of land to farm wages [3] show that, between 1910 and the 1920s, the relative price of land had fallen by two-thirds.

China.—Here we do get rents in the neighbourhood of half of the net product. A figure of precisely 50 per cent

[1] *Foreign Agriculture* (U.S. Department of Agriculture), June 1945.
[2] Dolinski, *Zeitschrift für Nazional-Ökonomie*, 1933.
[3] Lattimer, Canadian Political Science Association Proceedings, 1931.

is given by Hsiao-Jung Fei[1] for the Yangtze Valley, while a wider range of 45–60 per cent has been estimated for the whole country.[2] In the oasis agriculture of Chinese Turkestan[3] the landowners, who supply water rights and draught animals as well as land, take between 50 and 80 per cent of the crop.

These data, of course, refer to China in the past. But it is very probable that the amount which is being collected in taxes now is comparable to the amount which was collected in rents in the past.

Some interesting data were supplied by Professor Buck, showing the time trend between the years 1909–11 and 1929. During this period the prices received by farmers had risen three-fold, while rents had only doubled, and taxes increased by 50 per cent (payments to labour also only doubled). In other words, rent appears to have represented a declining share of product over this period. This gives some support to the hypothesis of a stationary or declining population, at any rate in agricultural areas.

Denmark.—An incidental remark in Professor Ohlin's *International and Inter-Regional Trade* indicates that between 1876 and 1902, while land values in Britain fell by 31 per cent, the fall in Denmark was slower.

Egypt.—It seems to be agreed that the net income from agriculture in Egypt in the 1930s was about £E82 m. per year, but estimates of rent differ. Professor Bresciani Turroni[4] estimates rents at 38 per cent of the net product, while Mr. Issawi[5] makes them 53 per cent. Mr. Issawi gives post-war figures, which showed rent at 38 per cent of the net product in 1950, rising sharply with rising prices in 1951, so that it is now probably nearer 50 per cent.

In the 1890s Vicomte D'Avenel[6] recorded rents as 7 hectolitres per hectare, or 31 per cent of the gross yield (say 40 per cent of the net yield). He compared this with

[1] *American Journal of Sociology*, July 1946.
[2] U.S National Planning Association, *China's Relief Needs.*
[3] Chang Chih-yi, *Geographical Review*, January 1949.
[4] *Weltwirtschaftliches Archiv*, October 1933.
[5] In his book *Egypt at Mid Century.*
[6] In his book *La Richesse privée depuis sept siècles.*

the ancient Egypt in which rents fell from 8·5 hectolitres per hectare in the first century A.D. to 5·3 in the third century (almost certainly a result of declining population).[1]

France.—Interesting information, stretching a long way back into history, is given by D'Avenel. In the twelfth century, when there was still much vacant land, free men cultivating wheat apparently paid only one-twelfth of the harvest in rent. In the Dauphiné he found figures ranging from one-seventh to one-eighteenth; and for olive land (where perhaps the population was more dense) figures ranging between one-fourth and one-eleventh.

For succeeding centuries he has a number of data for rents, converted to real terms in hectolitres of wheat per hectare of land. He records no average yield until 1815, when he gives a figure of 9 hectolitres per hectare; probably something like this prevailed through the Middle Ages. The fall in the level of real rents shows clearly the depopulation in the fifteenth century; and now confirms the contention made by demographers, which at first sight would be hard to believe, that France's pre-Black Death population was not regained until after the wars of Louis XIV.

TABLE XV

REAL RENTS IN HECTOLITRES PER HECTARE

1300–1350	1·25
1350–1400	0·92
1450–1500	0·85
1600–1650	0·87
1650–1700	1·13
1700–1750	0·96
1750–1800	1·66
1815	1·79

This last figure represents some 20 per cent of the gross product and about 27 per cent of the net product. But it

[1] He also mentions a figure for Austria in the 1890s of a rent of only 1·3 hectolitres of grain per hectare, or 9 per cent of the gross yield. This figure seems very low.

is still exclusive of taxation. From 1789, more precise calculations are made by Lavergne.[1]

TABLE XVI

NET PRODUCT AND ITS DIVISION (Francs per Hectare)

	Net Product	Rent	Taxes not Included in Rent	Wages including Imputed Wage for Own Labour	Farm Profit	Rent+Taxation as Percentage of Net Product
1789	49	12	7	25	5	39
1815	58	18	4	30	6	38
1859	95	30	5	50	10	37

A still higher figure for 1788 is computed by M. Mayer,[2] who finds rent (presumably including taxation) equal to 35 per cent of gross product, probably corresponding to over 45 per cent of net.

D'Avenel also gives figures of the price of land, also expressible in real terms as hectolitres of wheat per hectare.

TABLE XVII

PRICE OF HECTARE OF LAND IN TERMS OF HECTOLITRES OF WHEAT

1324–1400 . . .	10·6
1590	15·8
1501–1524 . . .	19·8
1625–1650 . . .	16·2
1650–1675 . . .	30·0
1788	47·7

These figures, however, reflect in part a change in rates of interest, which (on loans secured on land) fell from 10 per cent in the late fifteenth century to 6–7 per cent in the early seventeenth century. (On movable property the corresponding figures were 20 per cent and 8 per cent.) On houses (regarded as a better security than land) interest

[1] In *Économie rurale de la France*; quoted by Chabert.

[2] International Association for Research in Income and Wealth Conference, 1951.

rates in the eighteenth century were about 5 per cent but had fallen to about $3\frac{1}{2}$ per cent by 1789 (and were also very low during the securities boom at the time of Law, earlier in the century).

However, there seems to be a fairly clear residual effect of increasing pressure of population on land. D'Avenel advances what seems a fairly convincing piece of circumstantial evidence, namely that " le privilège de la chasse " only arose in the sixteenth century. Prior to that date, hunting had been open to all. Indeed, in some districts there was a legal obligation upon landowners to hunt wild animals whether they wished to or not. In mediaeval France there must have been large reserves of uncultivated land.

Chabert quotes an even more striking estimate (by Boislandry) that, from the death of Colbert up to 1827, wages rose two- or three-fold, rent seven-fold. He also quotes an estimate by Sée, that between 1800 and 1820 rent rose 50 per cent while wages only rose 20 per cent (and real product 18 per cent).

TABLE XVIII

	Average Yield Hectolitres per Hectare	Average Price Francs per Hectolitre	Real Rent Hectolitres per Hectare
Department Nord . .	40	22	6·0
Departments Cantal, Lozère, Aveyron . . .	$8\frac{1}{2}$	19	2·6
National average, 1895 (D'Avenel)	17	17	3·0

D'Avenel contended that the rents payable in France in 1789 were the highest in the world at that date.[1] For 1880 Leroy Beaulieu [2] finds a net product of 13·5 b. francs, of which rent (including taxes on land) now only took

[1] De Foville (in *Dictionnaire des Finances*) gives a figure of 56 francs as gross product per hectare at that date. Rent, excluding taxes, he gives at 27 per cent of gross product, and the purchase price of land at 8·9 times the gross product — i.e. an effective rate of interest of only 3 per cent " Wages, taxes and expenses " combined he put at 35 francs per hectare.

[2] In *La Répartition des Richesses*.

20 per cent. He estimated aggregate rents at 1·9 b. francs in 1860 and 2·4 b. in 1895 — in each case probably about the same proportion of net product as in 1880. He found that the ratio of rent to gross product on the poorest lands, where the price of the produce was also depressed by greater distances from markets, was almost the same as on the best lands — a puzzle for the Ricardian theorists (we can now see that on the best land there was also a great deal more alternative industrial employment offering).

By 1938 estimated rents were only 15 per cent of the net product of 69 b. francs.[1]

Guatemala.—We have some opportunity of observing rents in a rather primitive and at the same time sparsely populated country.[2] The rent of grazing for one sheep for one year was 24 U.S. cents; the sheep would produce 2 kilos of greasy wool, worth \$1·32, and in addition meat (its own and its lamb's) which we should value at least at as much as the wool; so that rents were less than 10 per cent of gross proceeds. Potato land paid \$7 per hectare rent. If we value the potatoes at \$25 per ton (which is much lower than the U.S. price) the cultivator could expect a yield of \$60 per hectare without manure, anything from \$125 to \$250 per hectare with manure.

India.—Cases have been recorded with rents equivalent to half the gross product. Since the 1930s, provincial legislation in most of the Indian states has restricted rents to one-fifth (or a smaller figure) of product; but not much is known of the enforcement of this legislation. Mr. Tiwari[3] showed evidence that some rents had doubled during the period 1900–1930, a time during which the general price rose less than 50 per cent.

Iraq.—Miss Doreen Warriner[4] quotes some interesting figures to show that in Northern Iraq, where a comparatively sparse population cultivates crops by natural rainfall, rents, including taxes, only amount to 20 per cent of the product, whereas in Southern Iraq, where a dense

[1] *Études et Conjoncture*, December 1947.
[2] Higbee, *Geographical Review*, April 1947.
[3] In *The Economic Prosperity of the United Provinces*.
[4] *Land and Poverty in the Middle East*.

population depends on irrigation channels owned by the landowners, rents take 60 or 70 per cent of the gross product, and taxation a further 10 per cent.

Ireland.—Sir Robert Giffen [1] estimated that in 1884 rents took 19 per cent of the net agricultural product of £40 m.

A study for Northern Ireland [2] showed gross rent in 1925 at only 14 per cent and net rent at 10 per cent of total net product (£10·6 millions). It is possible, however, that some deductions were neglected, and true net product may have been 15–20 per cent lower.

Israel.—Professor Bonné [3] estimated rent including taxation in 1933 at as high as 43 per cent of the net product of £P3·75 per hectare.

Italy.—An estimate by Professor Gasparini puts rent during the 1930s at 26 per cent of gross product, possibly 35 per cent of net.

Japan.—An extremely interesting study by Dr. Kurt Singer [4] describes the situation in the pre-1868 Tokugawa period, " whose economic measures displayed an amazing similarity to certain policies of eighteenth-century Western enlightened despots " — in spite of Japan's conscious effort to isolate herself completely from Europe (perhaps there is a moral to this tale). There were, in the legal sense of the word, virtually no rents. The Japanese peasant had become, for all practical purposes, the owner of the land which he cultivated, and also the science of farming had made considerable progress. But payments of the expected order of magnitude were exacted in the form of taxation. Except for some sporadic taxation upon merchants, this tax upon cultivators was the only taxation levied ; some of the cardinal doctrines of physiocracy must have been thought out independently by Japanese philosophers. The levy amounted to 50 per cent of the gross harvest on irrigated rice, less on upland rice — altogether probably about 50 per cent of the net yield.

[1] *Economic Enquiries and Studies.*
[2] Harkness, *Economic Journal*, 1929.
[3] *Archiv für Sozialwissenschaft*, 1933.
[4] *Economic Record* (Australia), December 1947.

This tax was collected, of course, by the Samurai, who were regarded (although they might occasionally fight among themselves) as both soldiers and administrators.

After the Westernisation of the country had begun, the Emperor Meiji made taxes payable in money instead of in kind. As a basis of assessment net revenues were taken as 85 per cent of gross, and on these net revenues a tax of 20 per cent was payable to the State and of 10 per cent to the local authority.

This intelligent and far-sighted Emperor did not, however, foresee the rise in the general price-level which was going to occur in Japan.[1] He gave each piece of land an official valuation, based upon the prices prevailing in 1870–74. In 1877 taxes were reduced from 30 to 25 per cent on the official valuation. Up to 1894 prices rose rapidly and the real burden of land taxation was greatly reduced. During the Sino-Japanese war of 1895 and the Russo-Japanese war of 1904–5 taxes were raised to 80 per cent of the official valuation, but this was only equivalent to a tax of about 30 per cent at current market prices. By 1914 the tax had fallen to about 10 per cent.

This general downward trend in taxes, at a time when land was still very much in demand because there was little alternative industrial employment offering, had of course the effect of creating "economic rents" which had not existed before. The extraordinary part of the story is that the Japanese Emperors, acting conscientiously upon the best advice available to them from contemporary European economists, decided that these rents could not be left with the peasants, and that they must go out of their way artificially to create a class of absentee landowners and rent receivers, by legislation which made it possible for urban fortunes to be invested in the purchase of agricultural land. These landowners remained until they were expropriated (with almost nominal compensation) by the American military administration after 1945.

[1] On the face of it, this was due to the fall in the world price of silver. But many economists would regard the price rise as an almost inevitable consequence of Japan's rapid industrialisation which would have come about whether the currency was based on silver or not.

The following gives money and real prices of land,[1] which rose rapidly as taxation was lightened:

TABLE XIX

	1886	1895	1914	1938
Yen per hectare:				
Irrigated (paddy)	404	870	2770	5190
Upland	123	280	1480	3040
Quintals of rough rice * per hectare:				
Irrigated (paddy)	81	70	124	216
Upland	25	23	166	127

* 1 quintal of rough rice = 0·737 of milled rice. The Japanese extraction rate is considerably higher than in other countries.

Between 1880 and 1930, according to Dr. Singer's estimates, while taxation per hectare doubled, gross money return per hectare increased $7\frac{1}{2}$-fold. Taxation on land, which furnished 80 per cent of Government revenue in 1875, furnished only 50 per cent in 1889, 20 per cent in 1908 and 8 per cent in 1933.

Rents are available[2] from 1913, and can be compared with yields per hectare.[3]

TABLE XX

GROSS YIELDS AND RENTS EXPRESSED IN QUINTALS * OF MILLED RICE PER HECTARE

	Gross Yield	Rent of Paddy Fields	Rent of Dry Fields
1913	22·8	8·6	4·5
1919–21	. .	8·8	— †
1933	25·3	7·9	6·6
1940	27·1	8·2	7·5

* The Japanese koku, a unit of volume and not of weight, of 1·804 hectolitres is equivalent to 1·05 quintals of rough rice.
† About 18 yen.

An alternative figure for 1927[4] gives rent at 311 yen per hectare or only 6·4 quintals of milled rice. For

[1] 1895 figures from D'Avenel.
[2] Grajdanzev, Institute of Pacific Relations, November 1941.
[3] From Wickizer and Bennett, *The Rice Economy of Monsoon Asia.*
[4] Yagi, *Kyoto University Economic Review*, 1930.

1930[1] rents were estimated at 281 yen per hectare of paddy land; but by this time prices had fallen considerably. By 1931, when prices were at their minimum, Dr. Singer gives rent at 188 yen per hectare, representing a figure, in real terms, very close to Grajdanzev's. In this year taxes took 42 per cent of all rents, but the ratio fell rapidly as prices rose in subsequent years. For such land as was rented in the 1870s, taxation took 60 per cent of the rents. Professor Yagi's figure for yield in 1927, when converted to net money values, shows a net yield of 658 yen per hectare, of which rent took 47 per cent (in the case of tenant farmers).

Netherlands.—The following data[2] show the gross and net rents as a percentage of the total net income produced by agriculture:

TABLE XXI

	Gross	Net
1923–26	45	35
1927–29	48	37
1936–39	39	29
1948–49	17	..

Spain.—A study[3] for 1903–12 showed net product at 4250 million pesetas, of which gross rent took 40 per cent, rent after taxes 37 per cent.

Sudan.—In the Gezira settlement the following is the customary allocation of the gross proceeds:[4]

TABLE XXII

Landowner	1/10
Waterwheel owner . .	1/10
Cattle to turn wheels . .	2/10
Seed and implements . .	4/30
Cattle fodder . . .	2/30
Working tenant . . .	4/10

[1] Shiomi, *Kyoto University Economic Review*, 1931.
[2] From Nos. 7 and 8 of series, *Monografieen van de Nederlandse Conjunctuur.*
[3] Vandellos, *Metron*, 1925.
[4] *Economic Development and Cultural Change* (Chicago), April 1953.

TABLE XXIII

Product and Rent in U.K. Agriculture, £ m.

	Gross Product [a]	Expenses [a] Excluding Land Tax and Rents	Net Factor Income	Rates [c] paid by Occupiers	Gross Rent [b]	Sum of Two Previous Columns as Percentage of Factor Income	Landowners' Maintenance Costs [d]
1867–69	229·8	52·6	177·2	8·0	62·5	39·8	3·8
1870–76	247·2	64·1	183·1	7·5	66·3	40·3	4·0
1877–85	219·2	61·5	157·7	5·9	65·2	45·1	4·0
1886–93	187·8	53·2	135·6	4·1	57·4	45·4	3·6
1894–1903	182·8	59·7	123·1	3·4	50·7	43·9	3·6
1904–10	200·8	65·7	135·1	3·5	50·7	40·1	3·9
1911–13	222·1	75·0	147·1	3·5	51·8	37·6	3·8
1920–22	490·0	157·0	333·0	4·5	..	..	14·0
1924 29	279·7	122·3	157·4	3·5	48·6	33·1	10·1
1930–34	236·5	96·9	139·6	..	44·3	29·6	9·5
1936–38	308·0	135·0	173·0	..	41·2	23·9	10·5
1952–53	1147·0	555·0	592·0	..	54·5	9·2	36·8
1953–54	1276·0	663·5	612·5	..	57·0	9·3	37·1
1954–55	1278·0	700·5	567·5	..	59·5	10·5	37·9

	Factor Income Excluding Landowners' Maintenance Costs	Net Rent [g]	Net Rent as Percentage of Factor Income Excluding Maintenance Costs	Landowners' Rates, Tithe and Land Tax payable from Net Rent	Average Price of Land £ per Acre [f]	Do. as Multiple of Net Rent per Equivalent Acre (after Paying Rates, etc.)
1867–69	173·4	66·7	38·5	4·0	..	..
1870–76	179·1	69·8	39·0	4·2	..	..
1877–85	153·7	67·1	43·6	4·5	68·0 [e]	37·4
1886–93	132·0	56·9	43·1	4·6	..	..
1894–1903	119·5	50·5	42·2	4·5	52·0 [e]	38·3
1904–10	131·2	50·3	38·3	4·1	..	..
1911–13	143·3	51·5	35·9	4·1	..	..
1920–22	319·0	..	..	..	30·8	..
1924–29	147·3	42·0	28·5	5·3	27·2	25·1
1930–34	130·1	34·8	26·7	4·4	24·1	26·8
1936–38	162·5	30·7	18·9	3·9	31·1	39·2
1952–53	555·0	17·7	3·2	3·0	89·0	204·0
1953–54	575·0	19·9	3·5	3·0	83·0	166·0
1954–55	530·0	21·6	4·1	3·0	84·0	153·0

[a] To 1934, from Ojala, *Agriculture and Economic Progress*. More recent figures computed in Agricultural Economics Research Institute.

[b] To 1934, computed by Mr. J. R. Bellerby. More recent figures given by Raeburn, *Three Banks Review*, December 1953, raised slightly to accord with Mr. Bellerby's definition, and extrapolated.

[c] Ojala's figures, less a deduction (computed by Mr. Bellerby) for rates paid by landowners.

[d] Figure for 1951 computed from Central Landowners' Association report indicating that in that year they amounted to 64·3 per cent of gross rents or 20·2 shillings per acre: extrapolated on the basis of building costs (which were their principal component) which were obtained from Jones's *Increasing Returns* up to 1922, London and Cambridge Economic Service Special Memorandum, 1934, and from National Income Blue Book since 1938.

[e] Palgrave, *Journal of the Royal Statistical Society*, 1905. Refer to 1877–81 and 1902–3.

[f] See *Farm Economist*, vol. vi, No. 5, and *Westminster Bank Review*, February 1955. Figures since 1936 refer to farms with vacant possession. The average for all farms in 1936–38 was £27·4.

[g] Including rates paid by occupiers.

Sweden.—Professor Ohlin states that between 1876 and 1902, when land values were falling heavily in Britain, they only fell by 4 per cent in Sweden.

Syria.—Miss Warriner found that in the growing of irrigated cereals, with a yield of £S540 per hectare, the owner of the land (and the water rights) took 60 per cent. Non-irrigated land yielded only £S140 per hectare, of which the landowner took 40–50 per cent (except where he also provided the draught animals and equipment, in which case he took 80 per cent).

United Kingdom.—Fairly precise information is available since the 1860s, showing gross rent as a high proportion of net product until 1914, and then gradually falling. The present figures are artificially low and will doubtless rise (see Table XXIII).

It should, however, be added that British farmers are generally equipped with costly buildings, and the rent includes the provision of a dwelling for the farmer.

An earlier computation,[1] relating to England and Wales alone, showed total net income from agriculture at £117 m. in 1860, of which gross rent, including rates and land taxes, took 43 per cent; exactly the same percentage was computed by Gregory King for England and Wales in 1688 (his total net income was £23·5 m.).

On the face of it, we should have expected rents in England and Wales to have risen gradually from mediaeval levels as the country became more densely populated. But one very interesting study[2] showed that the transformation in Wiltshire came quite suddenly, about 1530. Rents doubled within a decade before commodity prices had started to rise rapidly; from that date until 1660 rents rose at about the same rate as commodity prices.

United States.—Little land is rented in the U.S. and the only significant comparison which we can make is one between land values (excluding buildings) and net agricultural income. For the years for which we have land value data the results obtained are as in Table XXIV.

[1] Purdy, *Journal of the Royal Statistical Society*, 1861.

[2] Kerridge, *Economic History Review*, 1953–54.

It is reasonable to assume that the 1890 figure had been raised by speculation, and the 1900 figure had been unduly lowered after a decade of depression.

Assuming a fairly low rate of interest, and the inclusion of some speculative element in the price of land, these figures indicate rent taking some 20–25 per cent of net product.

TABLE XXIV

LAND VALUES/NET AGRICULTURAL INCOME

1880 . . .	5·95
1890 . . .	7·00
1900 . . .	4·32
1912 . . .	5·57
1922 . . .	5·90

A contemporary study[1] of wheat-growing in Michigan in the 1880s shows rents at \$2·70 per acre per year, i.e. 19½ per cent of the gross product or about 25 per cent of the net.

In 1929 Professor Black[2] found that the ratio of land value to net product was, on the whole, at its lowest in the poor Southern regions where net product per man was low, and at its highest in the Western, Central and Pacific regions where net product per man was high.

The measurement of the distribution of income between persons was made, in the previous edition, by use of the Pareto relationship only, which measures, on a double logarithmic diagram, the slope of the curve showing the cumulative numbers of incomes above specified limits. In many (but by no means all) cases this relationship is linear over a considerable part of the *income range*, though not of course for the majority of *income receivers*.

This is only one among several methods for measuring income distribution, although it has great practical advantages of simplicity.

[1] Caird, *Journal of the Royal Statistical Society*, 1885.
[2] Annals of the American Academy of Political Science, November 1936.

A great deal of new work is now going forward on improved methods of measuring income distributions, to find formulae which would be applicable over the whole range and not only over the upper tail of the data and which at the same time can be described in terms of two coefficients or so. A formula recently suggested by Professor Champernowne looks the most hopeful in this connection.

Until a convenient new formula has been settled, and reduced to practical form for measurement, the section dealing with distribution of personal incomes is omitted from the study. Some of the older information, based on Pareto coefficients, may prove to be somewhat wide of the mark when more valid measurements are made.

EXCURSUS

ECONOMIC COMPARISONS WITH THE ANCIENT WORLD

THE nineteenth century, impressed by its own inventions, particularly of steam engines and textile mills, tacitly assumed that both its level of economic well-being and its rate of progress were incomparably superior to anything that had gone before. The present century, whose technical achievements have been greater, has begun to learn modesty, and has realised that economic standards in the ancient world were not altogether out of comparison with those of the present day. There has been a great cheapening of transport, and of the mechanical production of certain (but by no means all) commodities; but there are also a number of goods and services whose efficiency of production has not so greatly increased.

Rostovtzeff writes in *Social and Economic History of the Roman Empire*: "In the history of the ancient world we have many epochs of high economic development: certain periods in the history of many Oriental monarchies, particularly Egypt, Babylonia and Persia: the age of the highest development of the city states, especially the fourth century B.C.; the period of the Hellenistic monarchies, where the climax was reached in the third century B.C.; the period of the late Roman republic and of the early Roman Empire. All these periods show different aspects of economic life and different aspects of capitalism. In none of them did the forms of house economy prevail. We may compare the economic aspect of life during these periods to that of many European countries in the time of the Renaissance and later. . . . While Egypt and Babylonia had a complex economic life, with a highly developed industry and wide commercial relations, other parts of the near East lived a quite different and much more primitive life. While Athens, Corinth, Rhodes, Syracuse, Tyre and Sidon in the fourth century B.C. were centres of a developed commercial capitalism, other Greek cities lived an almost purely agricultural life. In the Hellenistic and Roman periods it was just the same. . . . The

accumulation of capital and the introduction of improved methods in trade and industry proceeded more freely and successfully in the East than in the cities of Greece proper. Hence the commercial capitalism of the Greek cities of the fourth century (B.C.) attained an ever higher development, which brought the Hellenistic states very near to the stage of industrial capitalism that characterises the economic history of Europe in the nineteenth and twentieth centuries."

Statistical evidence in support of this last generalisation is given below. Rostovtzeff goes on to enumerate the economic factors involved: ". . . large internal market . . . growing external trade in competition with each other . . . improved technique of agricultural and of industrial production with the aid of pure and applied science . . . pure capitalistic economy based on slave labour . . . mass production of goods for an indefinite market . . . banking and credit . . . common civil law . . . stabilised currency". But as a retarding factor: "economic development stunted and atrophied by constant warfare".

"The Roman Empire began under the triple banner of peace, free trade, and disarmament, with an abundance of opportunity for private enterprise." [1] Large-scale enterprises grew up, whose products were transported over considerable distances. Of an unopened case of pottery bowls found at Pompeii — apparently delivered by a wholesaler just before the eruption — the majority of the contents were found to be from Gaul. The records of the pottery at La Graufesenque on the Rhone show that 30,000 pots were sold in a single transaction.[2] A glass-works at Cologne came to dominate the market for the whole western half of the Empire. Professor White notes the curious parallel between the extension of manufactures outward from Britain to the Commonwealth countries in the modern world, and the movement of industry from Italy to Gaul or Spain, after Augustus. This latter movement took place without any tariff protection or other artificial attractions. With the world at peace the supply of slaves (who had been principally prisoners of war) began to dry up (slave populations did not reproduce themselves). Italian employers, both rural and industrial, had been largely dependent on slave labour. Conditions for industries

[1] Professor White, *South African Journal of Economics*, December 1954.

[2] Mr. C. E. Stevens, private communication.

employing free wage-earners were more favourable in the outer provinces.

An attempt to make a direct comparison between real wages in the ancient world and those of the present day was made by H. S. Jevons (*Economic Journal,* 1896), whose data, together with others, are used below. The accounts of the building of the temple at Eleusis in 328 B.C. happen to have been fairly fully preserved, showing wages and the prices of certain materials, and Jevons made use of other information about the prices of the necessaries of life. He showed that real wages at that time were at any rate not entirely out of comparison with those of unskilled workers in the nineteenth century.

An unusually abundant supply of statistical information is available concerning Egypt under the Roman occupation, brought together in A. C. Johnson's volume on Egypt, in Tenney Frank's *Economic Survey of the Roman Empire.* No other volume in this survey yields comparable statistical material. In Egypt, archaeologists have been fortunate in finding several rubbish dumps containing old household accounts and letters, written on papyrus which has been preserved in the dry climate.

The diagram on page 656 shows all the data recorded by A. C. Johnson for prices[1] of wheat in Egypt per *artaba* of 50 lb. A general trend is clearly discernible, but the data are scattered round it much more widely than they would be in a diagram of modern times.

Similar extreme diversities of price have been recorded from mediaeval Europe and from present-day China, and have been explained by the interaction of an extremely inelastic demand upon a supply varying from season to season and from place to place. In the modern world seasonal fluctuations are mitigated by the large stocks which merchants usually carry over from year to year, and local fluctuations by transport, which in modern China and in mediaeval Europe is or was impeded not only by high costs but also by the exactions of war lords, bandits and pirates. In Roman Egypt, where no part of the province is far from water transport,

[1] These prices are measured in Egyptian drachmai, a currency which had been devalued under the Ptolemies to one quarter of the value of an Attic drachma. The rapid rise between 18 B.C. and A.D. 79 may be the long-run consequence of this devaluation.

we cannot claim the factor of high transport costs,[1] whatever may have been the case in other provinces more dependent on land transport. Nor was there any serious banditry, at any rate till the second and third centuries.

These fluctuations must therefore be attributed to variations in the yield from season to season, not adequately buffered by commercial or Governmental stocks. Roman Egypt had apparently failed to maintain the economic policy which was recommended to Pharaoh by Joseph.

To try to reckon the level or trend of real incomes on the price of wheat alone is a fallacious method which has led to many false

[1] Data quoted by A. C. Johnson for the third century indicate that river freights amounted to ¼ drachma per ton-mile and canal freights (where presumably smaller boats had to be used) to 1 dr. per ton-mile. A ship of 5½ tons, capable therefore of earning 1·4 drachmai per mile while travelling fully loaded, would charge 16 drachmai per day demurrage, which appears to be an appropriate fraction of its expected daily earnings. Costs of land transport were higher. In the Edict of Diocletian a freight rate of 37 denarii per ton-mile was allowed for land transport, equivalent on a silver content basis to 1·3 Egyptian drachmai of the third century A.D. Reasons are given below for thinking that Egyptian prices in the third century were in fact considerably higher than the silver content of the coinage would have indicated.

At the time of the building of the temple at Eleusis, when money wages were only at about half the level of the third century A.D., the land transport of 5 tons of marble for a distance of 25 miles cost 342 drachmai, or 3 dr. per ton-mile. Water transport at that time cost ¼–½ dr. per ton-mile. Allowing for the change in wage rates, the transport costs of the third century A.D. were substantially below these. The real costs of transport had apparently been reduced, possibly by the use of larger ships, though A. C. Johnson mentions a ship of 250 *artabai* (5½ tons) burden as representative. Were the ships plying between Peiraeus and Euboea in the fourth century B.C. still smaller, or did they require more crew per ton carried?

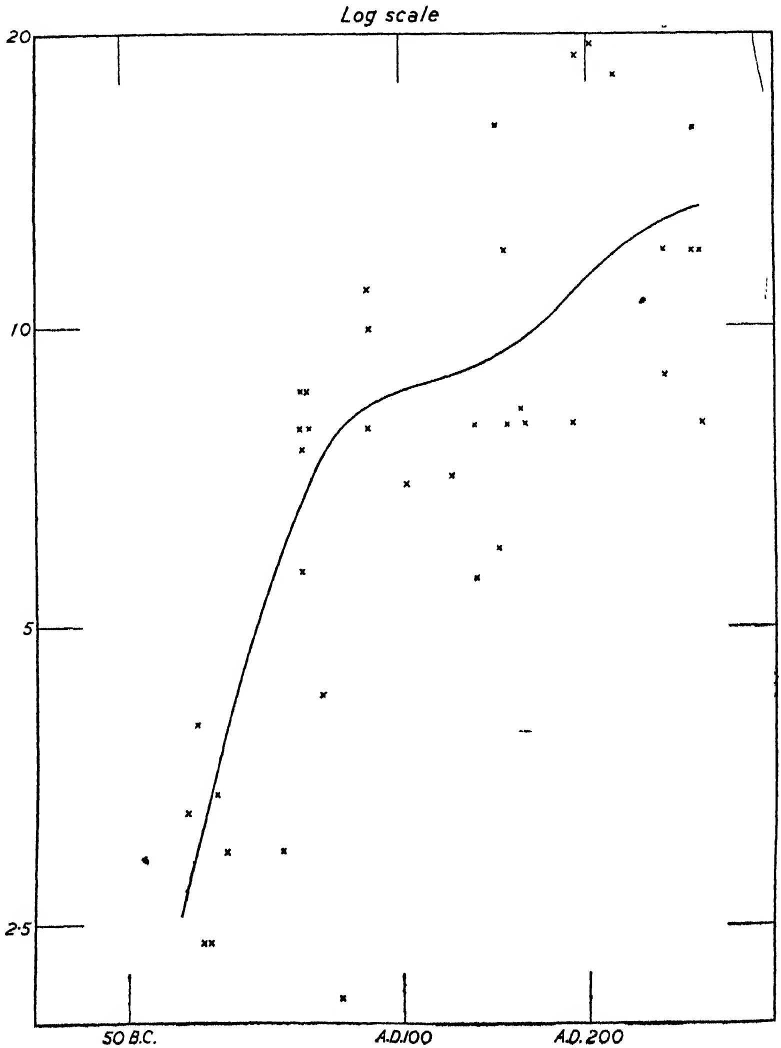
In long-distance sea transport there certainly seems to have been an advance. In the Hellenistic period Hieron II is said to have built a 5000-ton ship with a crew of 600. This probably was in advance of its time. But in the first century A.D. ships of 1335 tons were in use, though considered large: in the third century A.D. Lucian refers to a ship of 180′ × 45′ × 44′ (2700 tons) without regarding it as unusual. This ship only made one round voyage a year between Alexandria and Rome, earning a profit of 12 talents or 72,000 dr. If we assume a crew of 300 at a cost of 200 dr. per head, and a further allowance for general expenses, the gross takings may have been in the neighbourhood of 170,000 dr., i.e. 63 dr. per ton or 0·06 dr. per ton-mile, assuming the ship was fully loaded on the forward journey.

In the field of land transport there were doubtless some improvements in roads, though the invention which was to do most to cheapen both transport and agriculture in these ages — the horse-collar — was still awaiting discovery by some unknown genius of the Dark Ages.

Cato in the second century B.C. purchased an oil-press in Pompeii for 384 sesterces. Transport for 70 miles to his farm cost another 280 sesterces (Professor Childe, *What Happened in History*). This latter figure is equivalent to 70 denarii with the same silver content as 74 drachmai, i.e. a haulage cost of about 1 dr. per mile for an object presumably weighing only a fraction of a ton.

conclusions. The available soils and climates suitable for wheat-growing are limited, particularly in a world where transport costs are high, and this crop may be produced under very varying cost

PRICE OF WHEAT IN ANCIENT EGYPT IN DRACHMAI PER *ARTABA*
AS RECORDED BY A. C. JOHNSON



conditions. It is certainly not permissible to take the price of wheat as an index of general prices.

Enough information is available to yield a very interesting table (Table I overleaf) showing the relative value of other goods and services in terms of wheat at various dates in ancient times.

Of the other foods, it will be noticed that all, with the exception of olive oil at one date, show values greater than 1, in some cases much greater. This means that all these foods were relatively more abundant, and wheat relatively more scarce, in the ancient world than now.[1] Clothing also, it will be noticed, was comparatively cheap, or in other words, efficiency in production of clothing has not advanced as rapidly as in the production of wheat and of other goods. Shoes provide a significant exception, because here production was largely mechanised in the nineteenth century. (The same contrast between shoes and other clothing is noticeable in comparing eighteenth-century England and the present day.)

Very low ratios, on the other hand, indicate a great improvement in methods of production. The outstanding commodity in this class is nails.[2] Other low ratios are shown by iron and copper — the ancient world was significantly more efficient in the production of the latter metal [3] and also of lime, salt and pitch — comparatively bulky articles where transport costs would be involved. On the

[1] Mr. Steven Runciman (*Cambridge Economic History of Europe*) found that in the tenth-century Byzantine Empire the gold price of wheat was almost exactly the same as it was in Greece in 1914: but other goods were relatively cheaper five- or six-fold. We can trace the steady closing of the gap in later centuries. Thus Professor Warming (*Quarterly Journal of Economics*, 1922–23) shows that the ratio of the price of a kilo of butter to that of a kilo of wheat in Denmark was 11 in 1661–80, 16 in 1761–80, 20 in 1876–80, 27 in 1901–5.

[2] It is surely significant that in the results of the U.S. Commissioner of Labour's Surveys in 1898, summarised in Chapter VI above, comparing the effects of mechanisation in different industries, the list is headed by the nail industry. The direct labour cost by machine process was only 0·02 of that by hand process. In other words, the labour cost of making nails by hand in the early nineteenth century appears to have been of the same order of magnitude as it was in the ancient world.

[3] Professor Childe quotes data from which can be deduced the comparative value of iron in terms of copper. About 1800 B.C., in Asia Minor where the technique of iron-smelting had just been discovered, a kilo of iron cost 3–4 kilos of copper; by 800 B.C., only $\frac{3}{4}$ kilo; and, as shown in Table I, by the fourth century B.C., less than $\frac{1}{2}$ kilo, and $\frac{1}{7}$ kilo at the present day. The valved bellows necessary for making cast iron appear to have been discovered in the fourth century A.D. Previously, steel could only be made by repeated hammering by hand — a slow and costly process. This fact no doubt helped armies to be more heavily armed after that date.

Tin also was scarce in the ancient world. In Babylon about 1800 B.C. it was

 [*Footnote contd. on p.* 659

TABLE I

	Exchange Value, U.S.A., 1925–34, Lb. Wheat	Exchange Value against Wheat as Compared with the Present Day. (Present Exchange Value = 1·0) *
Foods other than wheat:		
Wine, litre	5·6	18 B.C., 2·8 ; A.D. 79, 11·0 ; A.D. 125, 4·6 ; A.D. 150–200, 3·1 ; third century A.D., 1·2 ; fourth century A.D., 0·7
Beer, litre	6·0	A.D. 37, 7·6 ; fourth century A.D., 7·5
Olive oil, litre	22·0	380 B.C., 2·5 ; † 310–300 B.C., 2·2 ; † 279–169 B.C., 3·9 ; † A.D. 1, 0·6 ; A.D. 118, 1·1 ; A.D. 255, 1·6 ; fourth century A.D., 3·5
Eggs, each	1·2	A.D. 46, 3·0 ; fourth century A.D., 8·2
Fowls, each	46·0	A.D. 42, 2·3 ; A.D. 151, 3·3 ; A.D. 169, 2·3 ; second century A.D., 1·5 ; fourth century A.D., 10·2
Beans, kilo	3·5	A.D. 255, 1·5 ; fourth century A.D., 3·0
Cattle, each	3000·0	590 B.C., 6·7 ; ‡ 480 B.C. (Sicily), 8·9 ; ‡ 410 B.C., 1·3 ; ‡ 375 B.C., 1·3 ; ‡ third century B.C., 2·5 ; § second century A.D., 3·3 ; third century A.D., 4·6 ; fourth century A.D., 4·3
Hay, cut, hectare	2350·0	A.D. 142, 1·1 ; A.D. 256, 1·5
Milk, retail, litre	9·3	13 B.C., 4·5
Sheep, each	510·0	590 B.C., 5·7 ‡
Milling, baking and selling of bread per kilo wheat content	3·0 ‖	A.D. 117, 6·8 ; tenth-century Byzantium, 6·5 ††
Other goods and services:		
Himation (thick tunic)	1450·0	392 B.C., 3·0 ; ‡ 328 B.C., 4·4 ; ¶ A.D. 36, 4·2
Shoes	200·0	388 B.C., 0·8 (best quality) ; ‡ 329 B.C., 1·8 (poor quality, wholesale) ‡ ; fourth century A.D., 6·1
Leather coat	700·0	328 B.C., 8·6 ¶
Straw hat	35·0	328 B.C., 7·8 ¶
Ox hides	445·0	380 B.C., 4·9 ; ‡ 350–300 B.C., 4·9 ‡ ; fourth century A.D., 7·4
Bricks thousands	800·0	328 B.C., 1·8 §
Lime, metric ton	550·0	328 B.C., 0·22 ¶
Pitch, kilo	6·7	A.D. 255, 0·37
Nails, kilo	4·5	328 B.C., 0·02 ; ¶ A.D. 255, 0·06
Rent of 3-roomed dwelling per annum	6400·0	Fifth century B.C., 3·0 ; ‡ 328 B.C., 7·9 ; ¶ second and third centuries A.D., 58·0
Laundering *himation*	35·0	Fifth century B.C., 1·6 §
Lead, kilo	8·8	Fourth century B.C., 7·3 §
Iron, kilo	1·14	Seventh century B.C., 0·08 ; § fourth century B.C., 0·095 §
Copper kilo	7·9	Fifth century B.C., 0·21 ; § fourth century B.C., 0·3 ; § Augustan period, 0·11 **
Salt, metric ton	220·0	Fourth century B.C., 0·7 § ; fourth century A.D., 2·5

* At the present day an ox, for example, exchanges against 3000 lb. wheat. In 590 B.C. it exchanged against only 447 lb. wheat (3000 ÷ 6·7). This shows that then, as compared with now, oxen were relatively abundant, wheat relatively scarce. By 410 B.C. the ox exchanged for 2300 (3000 ÷ 1·3) lb. of wheat, i.e. oxen were no longer, relatively, so abundant. A high figure in this column therefore indicates relative abundance in the ancient world, a low figure relative scarcity.

† Michel, *Canadian Journal of Economics and Political Science*, February 1946.

‡ Glotz, *Ancient Greece at Work*.

§ Michel, *Economics of Ancient Greece*.

‖ Based on British prices 1929. U.S. prices of bread are very high compared with other countries, probably due to the inclusion of other ingredients. The rate of extraction of flour (i.e. degree of whiteness of the loaf) appears to have been almost exactly the same then as now.

¶ Jevons, *Economic Journal*, 1896.

** Prof. Childe, *What Happened in History*.

†† Charanis, *Journal of Economic History*, Fall 1953. The official Byzantine price control regulations (which lapsed in the thirteenth century) allowed the miller-baker to keep the equivalent of 5/24 of the grain supplied to him, of which 4 were for expenses and 1 for net profit.

All data from 18 B.C. onwards from Tenney Frank, *Economic Survey of the Roman Empire*, vol. ii, Egypt, by A. C. Johnson, except those marked "Fourth Century A.D.", which are from the same author's extracts from the Edict of Diocletian.

other hand, the very high figure for lead can probably be explained by the fact that it was a by-product of silver-mining, produced in large quantities, and for which there was little demand.

The changes in the ratio for cattle are of great interest. This ratio was rapidly falling (i.e. meat becoming scarcer) in the sixth and fifth centuries B.C. Meat was abundant, M. Glotz points out, in Homeric times, subsequently becoming scarcer. A significant exception is the figure for Sicily, a country to whose abundant pastures even the poets drew attention. High costs of transport no doubt maintained a big price differential between Sicily and the mainland. By the third century B.C. the ratio had risen. It may be permissible to infer that, the population of Greece by that time having declined considerably, pasture land was relatively more abundant. The ratio went on rising through the second and third centuries A.D., probably for the same reason. M. Glotz points out that, as the pressure of population increased, wine, oil and honey had to be produced in exportable surplus in Attica to pay for grain. Export of olive oil was first authorised by Solon early in the sixth century. By the fifth century imports of timber were also necessary. There is some evidence of a fall in relative costs of production of olive oil after 279 B.C.

Most surprising of all are the figures for rents. Houses were a great deal more abundant at the end of the fourth century B.C. than they were in the fifth, a strong indication of declining population. In Egypt in the second and third centuries A.D. they were at give-away rents. The annual rent of a town house was only 20 drachmai, i.e. not more than five days' wages of a skilled worker.

about nine times the price of copper, as against a present-day ratio of less than four.

Silver is not a good standard for these comparisons. Its purchasing power over goods in general, as shown below, fell heavily between 600 B.C. and 300 B.C. Copper might prove to be a more stable unit for the measurement of value. If we adopt this basis we find the value of silver in terms of copper to be :

1800 B.C.	120–150
800 B.C.	150–180
Fifth century B.C.	200–300
Fourth century B.C.	150
Rome 269 B.C. (first silver coinage)	720
250 B.C. (was previous ratio untenable in international commerce?)	120
216 B.C.	112
130 B.C.	56
Augustan period	60
Fourth century A.D.	125

(Data from Professor Childe, Professor Michel and Sir Norman Angell's *Story of Money*.)

This alone would almost prove the contention that population was rapidly declining during that period, apart from the other evidence given later.

To obtain some idea of the general purchasing power of money in the ancient world we must first determine approximately the objects on which it was spent, or at any rate the relative importance of wheat, other foods, rent, clothing and other goods and services.

Family budgets collected by the Italian Government in the Province of Salerno in 1929 show that the consumption of cereals and bread (bread weighs almost exactly the same as the wheat from which it was milled, the water added about counterbalancing the bran removed) per head per year amounted to 279 kilos for peasant families and 202 kilos for wealthy families (who could afford more of other goods). In Egypt a consumption of about 175 kilos per head per year was regarded as the minimum necessary to support life. The ration for slaves, workmen and soldiers was 272 kilos per head per year.[1] (The figure of 279 kilos per head per year quoted above for an Italian peasant family corresponds to something like 350 kilos per adult male equivalent.) Jevons quotes a figure of 310 kilos for the ration of slaves in the fourth century B.C. M. Glotz estimates the consumption per head of the whole population of Attica at 244 kilos, Professor Michel at 210. In Athens towards the end of the fifth century B.C., the general level of wages (M. Glotz holds that at that time there was not much margin between skilled and unskilled wages) would have been about 1 drachma per day, or 300 drachmai per year. (There were a large number of feast days and other customary holidays.) A man, wife and two children would spend, in M. Glotz's opinion, 50 drachmai a year on clothing and 36 drachmai on rent. Such a family would probably consume about 875 kilos of wheat costing 45 drachmai and would probably spend rather more on other foods,[2] leaving about 40 per cent of their

[1] Rome in the second century A.D., with a population of about a million, imported annually 17 million bushels of grain (Professor Walbank, *Cambridge Economic History*). This represents as much as 460 kilos per head. Much of it must have been redistributed in the surrounding country, or fed to animals. A figure of 400 kilos is also estimated by Sir Norman Angell in *The Story of Money*.

[2] M. Glotz quotes figures of the quantities of food which each Spartiate was required to contribute to his *sussitia*. The quantities per head are about three times those of the present-day Italian budgets but the quantities of the different foods consumed are in more or less the same ratios to each other then as now. Perhaps it can be deduced from this that each Spartiate's contribution had to feed his family or servants as well as himself. (Those who have forgotten the nature

income. It is suggested below that the allowance for clothing may have been too small. If this is so, miscellaneous expenditure will represent less than 40 per cent of income. On the other hand, Professor Michel quotes Aristophanes as saying that food for a man, wife and one child would cost 177 drachmai per year. Perhaps some consumption other than food is included in this latter.

Round about 328 B.C. wages ranged from $1\frac{1}{2}$ drachmai per day for the unskilled to $2\frac{1}{2}$ drachmai per day for the most highly skilled.[1] Taking an average family income as 600 drachmai per year, the price of the same quantity of wheat would now be 110 drachmai. A slave's clothing then cost 45 drachmai per year, and the foreman received a clothing allowance of 110 drachmai per year. It looks as if an average family must have spent 25 per cent of its income on clothing.[2] Food and clothing between them will thus represent

of the institution of *sussitia* may recollect that the Spartiates, or aristocrats, lived a life of virtually permanent military service and took all their meals in a sort of officers' mess; it does not seem quite clear what provision was made for their families and servants.)

CONSUMPTION IN KILOS PER HEAD PER YEAR

	Italy, 1929		Spartiate Contribution to *Sussitia*
	Peasant Families	Wealthy Families	
Cereals and bread	279	202	800
Meat and fish	21	37	71
Cheese	4	7	37
Preserved fruit and vegetables .	21	8	18 (dried figs)
Wine (litres)	66	70	279

The figure for wine consumption is based on A. C. Johnson's value of the *chous* at 2·9 litres ; M. Glotz puts it as only about one-fifth this size. The larger figure certainly appears more probable.

The wheat equivalent, at prices then prevailing, of all the other foods included in the Spartiate's contribution to the *sussitia* was approximately 1000 kilos. This result serves to indicate that, at the prices then prevailing, wheat (or barley) consumption represented about half the total expenditure on food.

In I.U. terms the wheat consumption of a family of four would be 29 I.U., and the other foods, costing the same in drachmai, would be worth about four times as much in our terms, or 116 I.U., making a total food consumption of 145 I.U. or 36 I.U. per head.

[1] The architect of the temple received 720 dr. per year, i.e. about on the level of the skilled craftsman. Did not Eric Gill say that the greatest architecture was the works of men who "had come *up* from the scaffold, not *down* from the University" ?

[2] At the turn of the first and second centuries A.D. in Egypt (when the general purchasing power of the drachma was much lower) Tenney Frank estimated that the average adult would spend 20 drachmai per year on clothing. The cost of a minimum food ration (e.g. for slaves and apprentices) would be 50–60 drachmai per person per year.

rather less than half the income. Rent, however, has only risen to 45 drachmai per annum or 7½ per cent of income, and the remainder is available for other expenditure.

The well-known theologian Origen, practising a life of rigid asceticism in Alexandria in the third century A.D., spent 210 drachmai per year. In the second century when prices were lower the minimum cost of living for an adult was estimated at 130 drachmai per year. The price of the estimated minimum ration (173 kilos) of wheat was 58 drachmai in the second century and 92 drachmai in the third century.

In each of these cases the estimated minimum cost of living for an adult was a little below a quarter of the average annual earnings of a skilled man; and in each case purchases of wheat represented about 45 per cent of the estimated minimum cost of living.

We can now compile a table showing the purchasing power of the drachma at various dates in I.U.

TABLE II

	Purchasing Power in I.U. of the Drachma over				
	Wheat	Other Food and Wine	Dwellings	Other	Average, excluding Dwellings
400 B.C.	·67	1·34	2·0	1·8	..
400–375 B.C.	·45	..	..	..	..
350 B.C.	·22	..	..	..	..
328 B.C.	·27	0·56	2·11	0·75	..
300–200 B.C.	·22	..	..	..	..
18 B.C.	·28	0·68	..	..	·68
A.D. 79	·09	0·29	..	3·8	·28
A.D. 125	·084	0·28	..	..	·28
A.D. 150–200	·073	0·21	..	..	·21
Third century A.D.	·057	0·13	3·3	..	·13

Combining the data for 328 B.C., we find that the drachma had a purchasing power of just about 1 I.U. Applying this and the data for 400 B.C. as a base to a series [1] which M. Glotz gives for

[1] Based on the writings of Demetrius of Phaleron, apparently the world's first compiler of price index numbers.

the general trend of prices, the drachma had a purchasing power of 6 I.U. in 600 B.C., 4 I.U. in 480 B.C., 2 I.U. in 400 B.C. and 1·2 I.U. in 300 B.C. Just after the Alexandrine campaigns, as Professor Michel points out (*Canadian Journal of Economics and Political Science*, February 1946), prices were at their maximum [1] owing to the dispersal of the treasure hoards of the Persian Empire. During the subsequent century prices fell fairly heavily, as the supply of silver could not keep pace with the rapidly developing commerce of the Hellenistic world.

In Roman Egypt the extremely low level of rents has already been remarked. While this undoubtedly reduced the cost of living, to incorporate these figures in an index number of the general purchasing power of money would give an erroneous idea of the purchasing power of money over current output, or the current efficiency of production. An index is therefore compiled excluding dwellings.

These results may be compared with other estimates of the general purchasing power of money at this time. M. Glotz himself estimates the purchasing power of the drachma at four 1913 francs or 1·4 I.U., but does not make it quite clear to which period he is referring. Sir Compton Mackenzie in his book *Pericles* gives data indicating the purchasing power of the drachma at about 76 pence or 1·7 I.U. This is considerably lower than the figures for the fifth century previously given.

The data provided by the Edict of Diocletian are sufficiently abundant to make possible the preparation of a complete index number, using as weights present-day Italian peasant consumption which gives, as shown in Table III, a real standard of living comparable with that of the ancient world.

Thus in general 10,976 denarii purchased 178·3 I.U., or 61·5 denarii per I.U. This over-all average conceals extensive variations. Wheat was relatively one of the scarcest articles, costing 449 denarii per I.U., and other cereals were also pretty costly. For food as a whole, purchasing power stood at about 100 denarii per I.U., as can be seen from Table III; fruit and vegetables were relatively very cheap

[1] Between the time of Demosthenes and the price peak, wheat prices rose 2-fold, olive oil 3½-fold, wine 2½-fold. By 200 B.C. the price of wheat was about the same as in 350 B.C.: by 100 B.C. it was higher (Tarn, *Hellenistic Civilisation*). Professor Michel's index number indicates a low point of purchasing power about 330–324.

(as indeed they are relatively cheap now in Asia). A modern peasant would find expenditure on food and drink taking about half his income : in A.D. 301, to live in the same manner, 77 per cent of his cash expenditure would have had to have been on food. Changes in the price of grain made much more difference to our ancestors, even if they were living at the same real income level, than they do to us.

TABLE III

	Kilos per Adult per Annum	I.U. Value	Value in Denarii		I.U. Value	Value in Denarii
Bread and cereals :				Clothing . .	27	108
Grain content .	200·0 *	5·9	2580	Footwear .	4	92
Milling, baking and selling † .	..	12·4	803	Firewood .	7	469
Beef and mutton .	7·7	5·1	182	Passenger transport . .	4	424
Other meat and fish	12·8	7·0	315	Miscellaneous .	47	1410
Fats . . .	6·1	2·2	240			
Milk . . .	19·0	2·6	254			
Butter . . .	0·2	0·2	9			
Cheese . . .	4·0	2·8	118			
Eggs . . .	5·8	3·4	102			
Vegetables . .	84·3	8·4	76			
Fruit . . .	45·0	17·1	137			
Honey and sugar .	2·2	0·1	77			
Wine . . .	66·4	22·1	3580			
Total food and drink	..	89·3	8473	Total non-food .	89	2503

* Tenney Frank's estimate of average civilian consumption (30 modii). Soldiers were given an allowance of 48 modii, but presumably traded some of it for other goods.
† Data not given in Edict of Diocletian. Price imputed from ratios shown in previous table.

The purchasing power of the denarius was highest (10 or less per I.U.) over personal services such as haircutting-and hand tailoring ; was about 30 per I.U. for professional services (teaching and lawyers' fees) ; while rare and costly luxuries included soap (1570 denarii per I.U.), silk (4325 denarii per I.U.) and transport of goods by land (also about 4000 denarii per I.U.). Timber was costly for big lengths but cheap in 20-foot lengths.

A budget of 11,000 denarii per year seems quite a reasonable figure to take for an average family. A skilled craftsman, working 300 days per year, would earn 15,000 denarii, a labourer about half that amount.

A fascinating item for which we have no modern equivalent is a

horse-drawn sleeping-car at the moderate price of 7500 denarii. Apparently the Very Important Persons of those days travelled with a speed and comfort not subsequently equalled till a sleeping-car was built for Napoleon, who probably had to put up with much rougher roads.

The extreme rise in Egyptian prices between 18 B.C. and about A.D. 70 was apparently due to a depreciation of the currency not applicable to other parts of the Empire.[1] At about 18 B.C. the Egyptian price of wheat was some 2½ drachmai per *artaba*. For Greece no figure is available later than the third century B.C., when the price was 3·5 drachmai. The price per *artaba* in Rome, under Augustus, was given by Tenney Frank as 3½ denarii (1 denarius per modius), equivalent in silver content to 3·52 Greek drachmai, but to 14 Egyptian drachmai.[2]

The Aeginetan standard drachma adopted by Pheido of Argos, in the seventh century, is given by Professor Michel as 6·1 grammes of pure silver. Solon at Athens in 594 B.C., and the city of Corinth, used a drachma of 4·2 grammes. In 550 B.C. Peisistratus of Athens, likewise Euboea and Corinth, adopted the drachma of 4·4 grammes. About 400 B.C. Chios and Rhodes adopted the drachma of 3·9 grammes, whose use became general in the fourth century. This represents 8·3 pence at the price of silver prevailing before 1870 (i.e. at the time when silver still provided the general monetary standard for most of the world), or about 12½ per cent smaller than the standard weight adopted for francs, drachmai, lire, etc., in the nineteenth century. The imperial denarius, standard coin for the Roman Empire, contained about 90 per cent pure silver throughout the first century A.D. (Professor Michel, *Canadian Journal of Economics and Political Science*, February 1947), and contained at that time about 3·1 grammes of silver (A. C. Johnson). Tenney Frank equates 20 sesterces or 5 denarii to $1. This can hardly mean the

[1] A lesser factor may have been the integration of Egypt to the markets of the Empire, with consequent upward pressure on the price of Egyptian exports. Before the time of Pompey piracy had become very serious and long-distance commerce was probably on a very small scale. Under these circumstances a marked price differential might grow up between Egypt and the European provinces. Freight rates from Alexandria to Rome, in the big ships of the third century, were only about 1·4 drachmai per *artaba*. The smaller ships of the first century B.C. may have been more costly to run, but even so we can only explain the price differential on the assumption that commerce was in some way blocked.

[2] Ratios given by Professor A. C. Stewart.

pre-1865 silver dollar, which contained 24·1 grammes of pure silver. The number of grammes of pure silver exchangeable for $1 *rose* heavily after 1873. He may, however, have been intending to give an estimate of its purchasing power; but he does not make this clear. Professor Walbank[1] states that the denarius under Augustus and Tiberius contained 3·99 grammes of pure silver, after Nero's debasement still contained 3·41 grammes, under the Flavians 3·1 to 3·3 — higher figures than the other authorities. Nero's coins were debased, he states, by 10 per cent, Trajan's by 15 per cent, Marcus Aurelius's by 20–25 per cent, Commodus's by 33 per cent, Septimius Severus's by 50 per cent. There is some indication that the denarius was exchangeable with the drachma circulating in the Eastern Provinces. But in Egypt the currency was heavily devalued. By the middle of the first century A.D., the Egyptian tetradrachm, or 4-drachmai piece, was exchangeable for the drachma of the other Eastern Provinces, but even the tetradrachm only contained 2·2 grammes of silver. A. C. Johnson points out that other coins did not circulate in Egypt (bad currency drives out good!), and adds further that the ancient world shared our currency troubles and a system of exchange control was in operation at the Egyptian border whereby the purchasing power of Egyptian currency was kept even lower (i.e. prices in Egypt kept higher) than the equilibrium indicated by the silver content of the coinage. (This exchange control would presumably have been a prohibition on the export of silver coin or bullion.) Professor A. C. Stewart confirms the existence of this "exchange control", but adds that gold and silver coins had to be allowed to circulate in the Red Sea ports because of the trade with the East. By the third century, he considers, one tetradrachm exchanged for $1\frac{1}{4}$ Syrian or Asian drachmai, or for one denarius (the denarius was worth about $1\frac{1}{3}$ drachmai at the time of Nero's debasement of the coinage).

Equating Professor Michel's silver content of the denarius in the first century to A. C. Johnson's figure of 3·1 grammes silver content,[2] we have the following table of the subsequent devaluation of money:

[1] *Cambridge Economic History.*

[2] The first silver denarius coined in 269 B.C. weighed 4·7 grammes, that of 216 B.C. 4·1 (Sir Norman Angell).

TABLE IV

	Grammes of Silver per—		
	Imperial Denarius		Egyptian Tetradrachm
	Prof. Michel	A. C. Johnson	A. C. Johnson
A.D. 117	3·0	2·8	2·1
A.D. 138	2·6		
A.D. 161	2·3		
A.D. 193	1·7		
A.D. 218	1·5	1·7	0·9
A.D. 222	1·2		
A.D. 238	1·0		
A.D. 244	0·017		
A.D. 250–75	0·0007	0·5	0·7
A.D. 275–300	..	0·14	0·13

Tenney Frank quotes the following figures of soldiers' pay, which have been converted into grammes of silver. They probably reflect, he says, the general increase of prices, but may also indicate some " design on the part of Emperors to gain the support of the Army ".

TABLE V

	Salary in Denarii per Year	Do. in Grammes of Silver
Caesar and Augustus .	150	600
Tiberius . . .	225	900
Flavians . . .	300	840
Commodus . . .	375	635
Septimius Severus . .	500	850
Caracalla . . .	750	900

The increase apparently only just about kept pace with the currency depreciation.

It should be remembered that soldiers received in addition a large ration of grain, some of which they probably exchanged for other goods.

An interesting independent piece of information about the

purchasing power of money relates to the cost of constructing the Appian Way under Hadrian. Some of it was through mountainous country. The total cost was 25,000 denarii per mile. An analogous road, of about 8 ft. carriageway, and metalled to carry light traffic, would be an English farm road which cost £1 per yard to construct in the 1930s, or 10,000 I.U. per mile, and would have cost more in mountainous country. This gives the denarius a purchasing power of a little over 0·4 I.U. In purchasing a modius of wheat, under Augustus, it showed a purchasing power of only 0·22 I.U.

With the gradually increasing anarchy of the third century it is clear that there was an extensive inflation, though the two authorities differ somewhat as to its rate. With generals and local tyrants issuing their own coinage, the degree of depreciation of the coinage may have varied widely from year to year and from place to place.

Rostovtzeff quotes a case of an *artaba* of wheat in Egypt, at one stage of Diocletian's reign, being priced at 120,000 nominal drachmai. This must have been some token coinage even more debased than copper. Professor Walbank, in *Cambridge Economic History of Europe*, gives similar orders of magnitude for Egypt. In the course of a century the local drachma depreciated from the rate of 4000 to the rate of 180 millions per gold solidus.

When order was finally restored out of chaos by Diocletian at the end of the third century, the currency was placed on what we should now call a gold-exchange standard. The new denarius was supposed to be standardised at a rate of 50,000 to the pound of gold, or 0·00668 gramme of gold (Professor Michel), or approximately 0·107 gramme of silver.[1]

[1] The number of grammes of silver exchangeable for a gramme of gold at various dates, as given by the authorities previously quoted and by Professor Childe in *What Happened in History*, were as follows:

Babylonia, about 2000 B.C.	6·0
Persian Empire	13·5
Greece:	
Eighth to sixth century B.C.	15·0
Middle fifth century B.C.	14·0
400 B.C.	12·0
(N.B.—Prior to about 375 B.C. gold was sold in Greece in the form of bullion only and did not circulate as coin.)	
338 B.C.	10·0
306 B.C.	10·8
(N.B.—The dissipation of the Persian treasure hoards of 170,000 talents (4000 tons of pure silver or its gold equivalent, worth £35 millions at nineteenth-century silver prices) caused gold to become more abundant relative to silver.	

This stabilisation, however, was only temporary. A black market in gold promptly developed, and Professor Michel considers that a misguided attempt to maintain the purchasing power of the token coinage was the reason for Diocletian's notorious Edict of Prices. The Edict certainly attempted to give a purchasing power of 1 I.U. to 61½ denarii, or 2·11 I.U. to a gramme of silver — far higher than it had ever had before. Within two years the price of gold, which had been fixed at 50,000 denarii per lb., was officially raised to 60,000. Then it seems to have got out of control and to have risen steadily to 168,000 by A.D. 324, 473,000 by the late fourth century and 504,000 by the middle of the fifth century. Professor Walbank, however, gives quite different figures: 120,000 by 305, 324,000 by 324, 2,160,000 by 364, but then only 50 per cent further depreciation in the next thirty years.

When we get to figures of this size it is clear, however, that the "silver" currency is becoming titular. The last drachma was coined (according to Professor Stewart) in 296, and the denarius also ceased to circulate. By the time of Constantine nearly all transactions were financed in the new gold solidus (1/72 of a Roman pound, or 4·64 grammes of gold: but by the fifth century, according to Mr. C. E. Stevens, it was only 85 per cent fine, or 3·94 grammes). Some indications of its purchasing power are given by the information[1] that a solidus in the fifth century would buy 200–270 pounds of pork. Under the Edict of Diocletian, which fixed the price of pork at 12 denarii per pound, the same weight of gold would have purchased only 49 lb. of pork if exchanged for denarii at the "official" gold price. It seems clear, however, that the purchasing

but the old ratio was soon resumed — probably much of the gold was soon re-hoarded by the monarchs of the Succession States. Alexander set out to demonetise the Persian gold coinage.)

295 B.C.	12·0
280–270 B.C.	13·0
258 B.C.	13·3
Rome:	
207 B.C.	17·0
Reign of Augustus	12·5
Reign of Nero	13·0
Egypt:	
A.D. 70	8·0
(N.B.—Possibly this low figure is the result of a dispersal of Egyptian hoards after the Roman occupation. A higher rate seems to be quickly resumed.)	
A.D. 110	11·0
A.D. 241	10·0
Rome, fourth century A.D.	14·0–18·0
Europe, nineteenth century before 1870	15·5

Professor Jones, *Economic History Review*, 1952–53.

power parity exchange rate for gold, and hence the amount of pork purchasable for a given weight of gold, should have been some three times as high as this.

A solidus in the sixth century, according to Professor Jones, would buy 270 kilos of wheat in Egypt, about 200 elsewhere. Under the early Empire the same weight of gold would buy, according to Professor Jones, 180 kilos, but this figure is very much in conflict with the purchasing power of one modius per denarius previously given for the Augustan period. This latter figure corresponds to 25 modii per aureus of 7·96 grammes of gold, per solidus 12·4 modii or only 85 kilos (but the Egyptian price then was much lower than that prevailing at Rome).

Altogether, however, we conclude that the purchasing power of gold, by the fifth century, was *higher* than it had been some centuries earlier. This must make us view with caution hypotheses of the wholesale depopulation of the Empire. Depopulation appears to have occurred in Egypt, Greece and Italy,[1] but probably not in either the Western or the Eastern Provinces. The effect of depopulation, all other things being equal, would be to *lower* the purchasing power of gold (more gold per head of population, if the gold stock remains unchanged). It may be objected that there was a loss of population which was more than offset by the loss of gold to the East — Pliny's celebrated 100 million sesterces per annum. At the values of Pliny's time, this would be equivalent to 8 million (post-1934) dollars. The output of the gold mines in Roman Spain alone, according to Professor Walbank, was £10 millions per annum.

We can now bring together data of the purchasing power and the silver content of the coinage and construct a series which we may compare with Vicomte D'Avenel's series [2] showing the purchasing power of silver in France (see Table VI).

From the first to the third century A.D. the purchasing power of a gramme of silver, in Egypt, appears to have been about 0·5 I.U., probably considerably less in other provinces. At the time of the

[1] "It is doubtful whether Pliny's famous growl about latifundia having ruined Italy should be taken seriously." (Tenney Frank.)

[2] Published in *Histoire des prix* and in *La Fortune privée depuis sept siècles*. The series is based on 1890 when the franc had a purchasing power of 0·279 I.U. and a gold content of 0·29 gramme, equivalent to 4·45 grammes of silver at the pre-1870 price.

Edict of Diocletian it was 2·1 I.U. at the "official" gold price, probably about 0·7 in actuality.

By the sixth century A.D. wheat had become much dearer, in terms of meat, than it was in the earlier centuries. The only two data we have for prices at this time indicate a purchasing power, per gramme of silver, anywhere between 0·3 and 0·75 I.U. However, there appears to be some continuity between these figures and D'Avenel's estimate for A.D. 800. After this date, the rapid expansion of silver output caused its purchasing power to fall.

TABLE VI

PURCHASING POWER OF 1 GRAMME OF SILVER IN I.U.

	Ancient World			Mediaeval and Modern World	
	Purchasing Power of Drachma, I.U.	Silver Content, Grammes	Purchasing Power per Gramme		
600 B.C. . .	6	6·1	0·98	800 . .	0·56
480 B.C. . .	4	4·4	0·91	1201–25 .	0·28
400 B.C. . .	2	4·4	0·45	1226–1300 .	0·25
300 B.C. . .	1·2	3·9	0·31	1301–50 .	0·22

The rapid fall in the purchasing power of money in the fifth century B.C. was due to the development of silver mines at Laurion, in Macedonia and perhaps elsewhere. In the general confusion and contracting commerce of the last centuries B.C., its purchasing power rose. In the eleventh century, according to Professor Nef, silver output began to expand rapidly, falling 1350–1450, then rising again till the flood of American silver came in the sixteenth century. He considers that it probably fell between the fourth and the tenth centuries.

Having now some idea of the purchasing power of money, we can examine the available information about wages and incomes. Most of the information refers to wages and there is little on other classes of income. In all the figures which follow it is assumed that 300 days were worked per year.

In Athens in the late fifth century, according to M. Glotz, wages for all classes of workers were in the neighbourhood of 1 drachma per day. Apprentices received 3 obols (6 obols per drachma) per day.

Rural labourers received wages of 4 obols plus food worth 2 obols.[1] Professor Michel quotes Aristophanes' attack on the abuses which had grown up round the institution of *dikastes* or jurymen. Juries were not limited in number and were manned by any citizens who cared to attend ; they were swamped by numbers of idlers who were content with the fee of 2 obols (subsequently raised to 3) per day. Like some official payments in our own time, this amount had probably not been changed for many years, and represented a fair payment for a day's time when the value of money had been higher. Aristophanes comments that, in his own time, a man should expect 5 obols for a real day's work. Soldiers and sailors received 3 obols per day plus their rations.

A general standard of 5 to 6 obols per day at that time indicates a standard of living, for the free population, of about 500 I.U. per year per head of the working population. This takes no account of wealthy property-owners on the one hand, or of the slave population on the other. Population estimates for fifth-century Attica range from 215,000 to 350,000 of whom about one-third were slaves. The population of Laconia was estimated at 400,000 (M. Glotz) including 25,000 Spartiates, 100,000 *perioikoi* (traders and craftsmen) and 275,000 helots or serfs.

The real income of slaves, i.e. the value of food, clothing, shelter, etc., provided to them, was, curiously enough, not greatly below that of free workers. It was customary for owners of gangs of slaves to hire them out, the lessee to provide food, clothing and shelter. Professor Michel has examined a number of these contracts, which should indicate the difference between the market value of the slave's work and of his consumption. In the fifth century this appears to have been only 1 obol per slave per day. On an annual basis, allowing for the possibility that the owner might be unable to keep his slaves continuously employed, the net return was still lower and may have been only 40 drachmai per year. The purchase price of slaves at the end of the fifth century was about 130–150 drachmai for unskilled, 200-600 for skilled. Average ransoms for prisoners of war rose from 200 drachmai in the late sixth century to 300 in the early fourth century, and to 500 in the late fourth century, falling again in the third century. Bearing in mind the high rates of

[1] This confirms the estimate previously made that probably only about one-third of the average family income was spent on food.

interest then prevailing and comparatively short expectation of life even in healthy occupations (slaves employed in mining died like flies), even these figures accord with the low estimate of annual profit. In the middle of the fourth century our old friend Xenophon, the enthusiastic amateur in so many different fields, proposed that the Athenian Government should go into the slave-owning business by purchasing unskilled slaves at 150 drachmai each and employing them directly in the mines instead of leasing the mining rights. His suggestion was not adopted, but it may indicate that the price of 150 drachmai was unduly low in relation to their potential annual product.

Italy at the time of the accession of Augustus had, according to Tenney Frank, about the same ratio of slaves to population as had Attica four centuries earlier, namely 4 million slaves in a total population of 14 millions — in spite of the large numbers of prisoners-of-war captured during recent generations. In the Hellenistic world, according to Tarn, the standard price of a slave was 300 to 400 drachmai. As slave-owners have complained in more recent times, it did not pay to "breed" slaves. Tenney Frank states that the cost of rearing slave children in the first and second centuries A.D. was estimated at as high as 150–250 drachmai per year for their first two years and then 50 drachmai per year until puberty. But by this time prices were rising rapidly. The median price of an adult slave in Egypt was 1100 drachmai in the first century, 1250 in the second, 2600 in the third; and Columella, the agricultural expert of the first century A.D., was indeed recommending the breeding of slaves — it was then customary to liberate a slave woman who had borne three children. By the second century the number of slaves appears to have been very low, judging by the greatly decreased yield of the small manumission tax (which was levied at 5 per cent on value). Except during periods of recurring warfare when slaves were unduly abundant (e.g. third and second centuries B.C.), slavery in the ancient world was much more an urban than a rural phenomenon. Rural work in the Mediterranean is intermittent and employers only wanted slaves where they could be employed steadily. In any case, in most rural provinces slaves could not compete with free men — "wages were too low to make slave-holding profitable", as Tenney Frank puts it.

While we are discussing this macabre subject it is as well to

remind ourselves that slavery still prevails in the present-day world, and we can examine some of its economic relationships.

In *The Southern Gates of Arabia* Miss Freya Stark quotes figures to show that soldiers in the army of the Sultan of Makalla (who have to buy their own food) are paid 120–180 thalers per year, and that in the interior wages are about 120 thalers per year. An adolescent male slave [1] sells for 500 thalers. His expectation of life may be 30 years, but allowing for the scarcity of capital we should apply a high rate of discount, and regard the price as 10–15 years' purchase of the estimated net return. This makes the estimated net return 35–50 thalers per year, i.e. out of the average wage of 120 thalers, 70–85 thalers represents the necessary minimum cost of food and clothing.

Price data are given for food, and animal fodder, live sheep, salt and weapons, from which it appears that the thaler has a purchasing power of some 0·37 I.U. (On the coast the Indian rupee circulates : it has the same exchange value, namely 1s. 6d. sterling, as the thaler.) If we put the average income, including property incomes, at twice the wage for labour, we obtain an average real income of some 90 I.U. per occupied person.

The Bedouin income in Palestine was estimated by Gruenbaum at £4·5 per head, i.e. 31·5 I.U. per head or about 120 I.U. per occupied person.

Returning to ancient Athens, Solon in the sixth century B.C. placed the free population in four legal categories as follows :

(i) *Pentakosiomedimnoi*, or owners of land yielding a crop of 500 *medimnoi* (750 bushels) or more.

(ii) *Hippeis*, or knights, below the first rank but able to provide horses for themselves and for a groom.

(iii) *Zeugitai*, whose qualification was the ownership of a team of oxen, a class including all but the smallest landowners. These were entitled to go into battle as *hoplites*, or wearers of heavy armour.

(iv) *Thetes*, landless and smallest landowners, who went into battle as light infantry.

[1] Other prices for slaves were : wet nurse, 800 thalers ; 5-year-old boy, 400 thalers ; 5-year-old girl, 300 thalers ; wife, 60 thalers if virgin, 30 thalers if non-virgin.

At that time a *medimnus* of barley sold for a drachma and the general purchasing power of the drachma was probably about 6 I.U. Almost immediately after Solon's time these four classes became stereotyped as income classes (over 500 drachmai per year, 300–500, 200–300, under 200), and the wealthier manufacturers and traders began to qualify as "Knights" — a social phenomenon of so many civilisations. With the general fall of the purchasing power of money, increasing numbers of citizens qualified for the privileges of the higher classes, and by the middle of the fifth century these classes had become titular only.[1]

From these classifications it appears that the income of the average landowning family may have been as high as 300 drachmai or 1800 I.U. This, however, represented the product of the labour, in all probability, of several working members of the family, and in some cases also of slaves, although the employment of slaves was always rather urban than rural.

By a later date we can be fairly sure that a number of big incomes were earned in commerce and manufacture as well as those earned from land.

This must have occurred in Babylon too, judging from Professor Childe's statement that the two-storied house of a successful merchant in the seventh century B.C. measured 100 ft. by 82 ft. and contained 18 rooms, including the bathroom. The salary of a

[1] A high degree of income equality had apparently been established by the fourth century B.C., which disappeared again later.

"When Xenophon returned after the famous expedition with Cyrus, he hired himself and 6000 of the Greeks into the service of Sosthenes, a prince of Thrace; and the articles of his agreement were, that each soldier should receive a *daric* a month, each Captain two *darics*, and he himself, as General, four; a regulation of pay which would not a little surprise our modern officers.

"Demosthenes and Aeschines, with eight more, were sent ambassadors to Philip of Macedon, and their appointments for above four months were a thousand *drachmai*, which is less than a *drachma* a day for each ambassador. But a *drachma* a day, nay, sometimes two, was the pay of a common foot soldier.

"A centurion among the Romans had only double pay to a private man in Polybius's time, and we accordingly find the gratuities after a triumph regulated by that proportion. But Mark Antony and the triumvirate gave the centurions five times the reward of the other; so much had the increase of the commonwealth increased the inequality among the citizens." (David Hume, *Of the Populousness of Ancient Nations.*)

Since Hume's time our ideas on relative incomes have gone back to the Greek standards. Recent rates of pay in the British Army provide for men of six years' service, inclusive of keep reckoned at 7s. per day, 99s. a day for a Brigadier, 46s. for a Captain, and 17s. 6d. for a three-star private.

drachma. In Alexandria both wages and prices were higher. Even allowing for a general fall in prices in the third century, these wages appear very low. Hellenistic standards of living, though they may have risen in other kingdoms, appear to have been low in Egypt, where the population was probably already very dense in relation to the means of subsistence. It may be only that Ptolemaic Egypt was a highly "regulated" economy, in which peasants were not free to leave their holdings, and much business was reserved for royal monopolies. These factors tended to promote both low real incomes and currency depreciation.

M. Glotz considers that in Alexander's time [1] Egypt's population stood at 7 millions, i.e. the same as A. C. Johnson's estimate for three centuries later.

The following table shows the available information on wages collected by A. C. Johnson for Egypt in the later period, converted to I.U. by means of the above index numbers :

TABLE VII

AVERAGE WAGES PER YEAR ASSUMING 300 WORKING DAYS

	Boys	Farm and General Labourers	Skilled Men	Shepherds	Money Wages, Base 18 B.C.	Real Wages, Base 18 B.C.
About 18 B.C.	..	72	102	156	100	100
About A.D. 79	36	60	72	..	187	77
A.D. 125	..	108	..	..	360	148
A.D. 150–200	54	72	..	..	340	105
Third century A.D.	..	60	156	..	600	115

These figures indicate a standard of living comparable with Asiatic countries at the present time. Rostovtzeff states that wages of 4 to 6 obols per day in the first and second centuries A.D. for unskilled men would buy 550 to 800 kilograms of grain per year, "hardly sufficient to keep a family alive". This is slightly overstated; but there is no doubt that it was a low real income. By A.D. 250, with the deterioration of the currency, the average wage had risen to 5 drachmai per day; but it is doubtful whether its real purchasing power was much higher.

[1] At this date he estimates the population of Greece proper at 2½ millions, Macedonia 3–4 millions, Syria 30 millions.

Wages fixed by the Edict of Diocletian, assuming a 300-day year and valuing a man's keep at 9500 denarii per year, were equivalent to 255 I.U. per year for labourers, 400 I.U. per year for skilled men, over 1000 I.U. for teachers and up to 1500 I.U. for artists. The general average was apparently no higher than in Greece seven centuries earlier, but the dispersion has become much wider.

Professor Michel computed the average wheat yield in Attica in 328 B.C. at only 6½ quintals per hectare, but regarded about 9 quintals as normal. He states that much higher yields were obtained in Egypt, Babylonia and Sicily. A. C. Johnson states the normal Egyptian yield at 17 quintals per hectare. Until a few years ago, the modern Egyptian yield stood at almost exactly this figure, but during the last few years it has been raised to 21 quintals per hectare by the use of artificial fertilisers and in other ways. The present Greek figure stands at about 9, and was lower in the recent past. The detailed account given in the *Georgics* of the plough carefully constructed out of three different kinds of wood with an iron share, the wagons, the saws, the budding and grafting of fruit trees, the cultivation of vines, olives and legumes, the careful breeding of cattle, the consulting of the calendar, all indicate quite an advanced agricultural technique.

TABLE VIII

	Land Rents, Quintals per Hectare	Price of Land, Quintals per Hectare	Rate of Return on Investment, per Cent
First century A.D.	6·4	34	19
A.D. 100–150 .	5·6	28	16
A.D. 150–200 .	3·7		
A.D. 200–285 .	4·4	31	14

That the population of Egypt was falling during the Roman period is suggested by the extraordinarily low rents of houses, and the increasing relative abundance of cattle, mentioned above, but the final and most convincing proof is obtained from the figures showing the trend of land rents and land prices expressed in real terms. These almost certainly indicate a decreasing pressure of population upon resources. A rent amounting to over one-third of the gross produce (as in the first century A.D.) indicates an extreme

pressure of population on resources. In Attica in the fifth century B.C. rent was only 8–10 per cent of the gross output.

A. C. Johnson states that the customary rate of interest was 12 to 12½ per cent. The higher rate of return in the first century may have indicated that, in practice, still higher rates were obtainable owing to the shortage of capital in relation to population. Tenney Frank further states that, with more settled conditions under Augustus, rates of interest fell suddenly and drastically from 10 per cent to 4 per cent.

Rostovtzeff strongly denies the widely held proposition that population was declining in the first three or four centuries A.D. He bases his opinion mainly on the evidence of the large number of new cities founded during this period. While he may have proved his case regarding the Western Provinces and North Africa, it certainly seems that a decline was occurring in Egypt, likewise in Italy and Greece. A. C. Johnson points out that by the latter half of the second century, flight of peasants from their villages was widespread, and in consequence the authorities issued orders enforcing the cultivation of Crown lands. He concludes: "Probably lands in some villages were temporarily or permanently abandoned and the peasants were concentrated on more productive areas". In the second century the industrial activity of Alexandria probably led to a strong urban movement (Caracalla, A.D. 215, endeavoured to banish all peasants from Alexandria) and no change in total population resulted. In the third century the impoverished peasant could find no work in the city and when he abandoned his farm he turned to brigandage. If we had official records we should probably find that the rural and urban population greatly declined during this period. There does not seem to be much doubt about the fall in the population of Italy, which was probably accentuated when Italy lost her special privileges and was treated just like any other province after the time of Severus.

In the time of Augustus the population of Egypt was 7½ millions, including 1 million Jews. Alexandria had a population of ½ million in Nero's time. When modern estimates began, about 1800, they show Egypt with a population of only 2½ millions. There is no knowing when the decline occurred,[1] but it is quite plausible

[1] Professor A. C. Stewart thinks that the decline probably occurred after the Turkish conquest.

that some at any rate of it should have occurred in the first three centuries A.D.

That the population of Greece was falling through the third and second centuries B.C. is also generally recognised: probably due both to low reproductivity and to the attraction of immigrants to the economic opportunities of the Hellenistic kingdoms. This supposition is strikingly confirmed by Professor Michel's quotation (*Canadian Journal of Economics and Political Science*, February 1946) of the rents of fifteen farms on Delos, probably let for wine cultivation.

Drachmai per Year

434 B.C.	7,500	280 B.C.	10,300
377–374 B.C.	7,800	270 B.C.	11,300
314 B.C.	11,500	260 B.C.	8,800
305 B.C.	14,300	250 B.C.	9,300
300 B.C.	16,200	220 B.C.	6,100
290 B.C.	9,600	179 B.C.	5,900

These clearly show the effect of the increased circulation of silver after the Alexandrine campaigns. During the third century prices admittedly fell, but probably not as rapidly as the rents shown above. Measured in man-years by means of the wages paid on Delos, the average rent per farm fell from 8·0 in 305 to 5·5 in 296, 4·2 in 269 and 3·3 in 169. We seem to have here fairly strong indications of a falling population. Professor Michel remarks that the wine export trade to the Black Sea was falling off in comparison with what it had been in previous centuries — is not the decrease in population and the decreasing demand for imported wheat a sufficient explanation?

M. Glotz has also shown that the rate of interest fell from 12½ per cent in the fourth century to 10 per cent in the third century and 7 per cent in the second century — probably an indication that money and capital were becoming more abundant in relation to population. The rate of interest again rose under the Roman Empire.

A few interesting data are also available on seaborne trade and on public finance.

The aggregate seaborne commerce (imports and exports combined) of the whole Delian League or Athenian Federation, before

the Peloponnesian War, was estimated by M. Glotz at 186 million drachmai. In the year 413 B.C., during the war, it was still 150 million drachmai.

These figures are astonishingly high. If the whole of Greece had a population of 2½ millions or, say, a working population of 1 million, the working population of the League must have been half a million or less. This means that import and export trade must have averaged nearly 400 drachmai per head of the working population, whereas we have estimated the national income at only 300 drachmai per head of the working population at this time. In the modern world the sum of exports and imports has been known to reach two-thirds of the national income in countries like Norway, New Zealand and modern Greece, which are unusually dependent on sea transport. If we imagine any of these countries subdivided into a large number of small states, and include in import and export statistics all seaborne traffic between them (with the further provision that land transport is so expensive that all traffic possible goes by sea), then we may perhaps contemplate a combined aggregate of imports and exports exceeding the national income by a third. (It will be borne in mind that many goods may be reflected in these statistics several times over, as raw materials, as semi-finished goods, and in *entrepôt* trade.) Even so, we are compelled to hypothecate a remarkably high level of commercial organisation.

The revenue of the Athenian Treasury in 433 B.C. was 6 million drachmai or 50 drachmai per head of working population. In 422 B.C., a war year, this revenue was doubled. The former figure represents 17 per cent of the national income. A ratio of taxation to national income at this level could not have been sustained in peace-time, nor indeed a ratio of 34 per cent in war-time: a large part of these revenues, however, was obtained by levies on other states belonging to the League.

After the Peloponnesian War there was a tremendous contraction of commerce, following upon the break-up of the League and the Spartan occupation of Byzantium and other key points. The trade of the Peiraeus in the early fourth century was only about 12½ million drachmai per year or about 100 drachmai per head of the working population of Attica, and in 355 B.C. the revenue of the Athenian Treasury was only 780,000 drachmai. By 340 B.C., however, on the eve of Chaeroneia, it had risen to 2·4 million

drachmai. Did this rapid economic recovery stimulate King Philip of Macedonia to attack before the opposition became too strong? Under the Macedonian supremacy commerce continued to expand, and by 326 the revenue had risen to 7·2 million drachmai — 20 per cent higher in face value than a century earlier, but considerably lower in real purchasing power.

The above figure of 6 million drachmai (a thousand talents) is estimated by Andreade.[1] Of this revenue, however, 415 talents was tribute from allies, the remainder customs and other revenue. As the war proceeded, tribute was raised to 900 talents in 427 and 1200 in 417. At the end of the war in 404 there was no tribute and only a revenue of 30 talents from customs. But by 373 there was again a revenue of 200 talents from tributes of allies. Later figures agree with those given above, except that the revenue of 7·2 million drachmai (1200 talents) continued unchanged until 307.

The tolls on imports and exports at the Peiraeus were levied by the Athenian Treasury at the rate of 2 per cent. From these receipts it is deduced that even in 400 B.C. aggregate trade was 9 million drachmai, the following year 10·8 millions.

By the third century B.C. the commerce of Rhodes had risen to 50 million drachmai. No estimate of the population is available to reduce this to a per head basis, but it appears to be a very considerable figure.

Byzantium[2] collected revenues at the rate of 10 per cent on imports and exports in the twelfth century. They were at the rate of 93 kilos of gold per day. By the fourteenth century, however, when the customs at Galata was controlled by the Genoese, they received less than 1000 kilos of gold from them, while Byzantium received only 150 kilos of gold per year.

Roman Egypt had to pay taxation, according to A. C. Johnson, equivalent to 30 million *artabai* of wheat or 40 million I.U., i.e. some 16 I.U. per head of the working population, a heavy exaction from a community whose total income was probably only 100–200 I.U. per head of the working population.

Tenney Frank states that by A.D. 64 (by which date the canals had been fully restored after their previous neglect) revenue rose

[1] International Statistical Institute Conference, 1931. He regards the talent as the equivalent of 5400 gold francs.

[2] Charanis, *Journal of Economic History* (U.S.), Fall 1953.

to 576 million sesterces, ten times what it had been under Augustus. It provided a large share of the total Imperial revenues of 1450 million sesterces.

These Imperial revenues, however (like those of mediaeval kings), were rather rigidly fixed. After the time of Severus, as the size of the army increased, as the population to support it probably decreased, and with increasing invasions, civil wars and military uprisings, the army, lacking regular financial resources, increasingly had recourse to arbitrary requisitioning.[1] In any case, as things were in the third century, the collection of revenues in a rapidly deteriorating currency would not have sufficed to maintain the swollen army and Civil Service. By Diocletian's time, taxation became payable in kind. The tax in kind was assessed both upon men and upon land. As peasants increasingly abandoned their land, to find work in the cities, to join the army, to emigrate to the outer provinces or, in some cases, to join gangs of bandits, regulations were introduced forbidding them to move. They became *adscripti glebae*, men legally bound to remain on the same land. In fact, they were serfs.[2] Early in the fourth century, the same compulsion was being applied to urban workers. Work in certain trades, including shipping and baking, became an hereditary obligation ; the sons of men in these trades were legally bound to remain in them.

So the ancient world crossed the threshold which separates the free man from the serf, commercial economy from the " natural economy ", contract from status.

[1] Professor Jones, *Economic History Review*, 1952–53.

[2] Ibn Khaldun may have had Diocletian in mind. He lists various types of economic injustice mentioning the appropriation of property, the fixation of prices, and the institution of compulsory labour, which he regards as the worst.

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